The DENTAL JOURNAL OF Australia

MEMBERSHIP ISSUE

AUSTRALIAN DENTAL ASSOCIATION N.S.W. BRANCH

VOLUME - - - - - - - - 25
NUMBER - - - - - - - - 9-10
SEPTEMBER-OCTOBER - 1951

REGISTERED AT THE G.P.O., SYDNEY, FOR TRANSMISSION BY POST AS A NEWSPAPER.

The DENTAL Journal OF AUSTRALIA

Vol. 23 September-October, 1951 No. 9-10

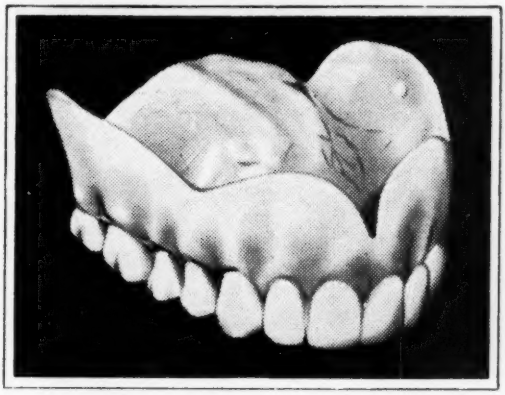
CONTENTS

Honorary Editor: J. W. SKINNER, M.D.S.

Published by the Australian Dental Association (N.S.W. Branch)
B.M.A. HOUSE, 135-137 MACQUARIE STREET, SYDNEY.

Communications intended for publication in "The Dental Journal of Australia" should be addressed to the Honorary Editor. All advertising and business matters should be directed to the Secretary.

Subscription: £1/5/- per annum; Overseas, £1/10/-; Single Copy, 5/-.



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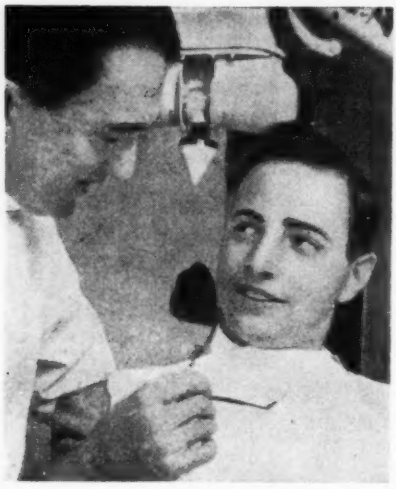

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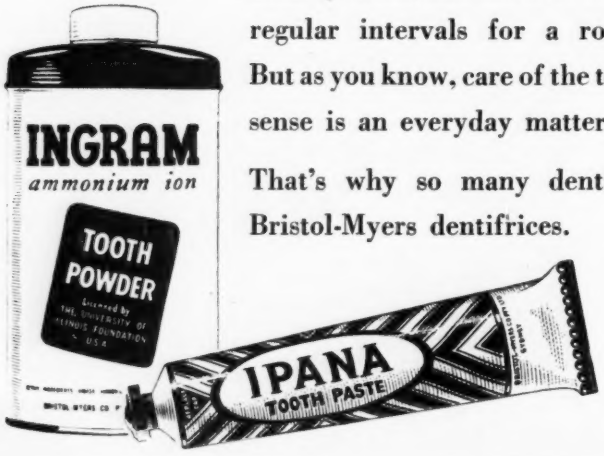

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THE PROBLEM OF THE MANDIBULAR DENTURE*

W. J. TUCKFIELD, D.D.Sc. (MELB.).

We so often hear it said that the mandibular denture is a problem. What is this problem and to whom is it a problem?

It may appear to be a problem to the patient, for many patients find their mandibular dentures difficult to wear. In fact, many expect when they attend the dentist to experience a difficulty with this denture and there are two reasons for this expectation:—

1. They probably know of some friend or neighbour who has experienced difficulty.
2. They perhaps have heard dentists say that this denture is never as satisfactory as the maxillary one.

Now, *is* there a real problem?

Insofar as the patient is concerned there appears to be one, but I consider that for the dentist there rarely should be any particular technical problem.

It is not correct to say that as a part of a set of full dentures the maxillary one is a success if the mandibular one will not function with it. How can the maxillary denture be satisfactory if the patient cannot masticate his food? Actually, in many cases, it is a lack of satisfactory occlusion between the mandibular and maxillary dentures which causes the mandibular denture to be a failure, and were it not necessary to masticate food, many unsatisfactory mandibular dentures might be quite satisfactory. However, owing to the fact that there is a better retention in the case of the maxillary denture because of the large palatal area, the maxillary one often stays *in situ*, despite faulty occlusion, while the poor unfortunate mandibular denture, often having to sit upon a very poor ridge or no ridge at all, and having no large palatal surface for retentive purposes, moves about and becomes mixed up with the food the patient is attempting to masticate.

A maxillary denture cannot possibly be satisfactory no matter how comfortable it may be, nor how strongly it is retained, unless when masticatory movements are carried out, both dentures are stable and remain *in situ*. So I contend that there is not merely a problem of making a satisfactory mandibular denture—the problem involved is to make full maxillary and mandibular dentures which will function as a pair.

*Lecture (abridged) delivered before the Australian Dental Association, New South Wales Branch, on April 24, 1951.

Is the mandibular denture a real problem? For the patient we have acknowledged that it is, but for the dentist I contend there should rarely be a technical problem. I am also prepared to go a step further and say that when a patient presents for full dentures and there is excessive absorption of the maxillary ridge, a flat vault which is very hard and with little submucous tissue, the construction of a satisfactory maxillary denture may be a much more difficult proposition then the construction of the majority of mandibular dentures.

I firmly believe that if each practitioner took his responsibilities seriously and conscientiously, there would be no specific problem in the mandibular denture either for himself or the patient. I know that the mandibular denture does not as a rule have the same degree of retention as the maxillary one, but retention as such is not so important for the mandibular denture. With the mouth open and no function being carried out, a maxillary denture, not having retention, falls to the embarrassment of the patient, but the mandibular denture remains more or less *in situ*, retention or not. That retentive force, so loosely termed "suction", is necessary for maxillary dentures but not so for the mandibular denture.

There is a difference between the term "retention" and "stability." Retention as related to artificial dentures is the resistance offered to a direct force at right angles to the seating surface which tends to lift the denture from the supporting surface of the tissues.

Stability refers to the maintenance of equilibrium and to the resistance to displacement when masticatory forces act in general towards the seating surfaces.

Retention is largely dependent upon the impression and the periphery of the denture. Stability is only partly, and comparatively speaking only in small measure, related to the impression, but it is largely dependent upon correct vertical dimension, the shape of the polished surfaces, tooth placement in relation to the ridges, to balanced articulation, and freedom from cusp interference.

Stability is the all-important requisite for the mandibular denture and this is not dependent upon "suction" but on other factors, some of which I have mentioned and all of which will be discussed later.

I shall acknowledge, despite what I have said to the contrary, that there is a problem to the dentist regarding the mandibular denture as part of the complete set of dentures but, as aforesaid, it is not in the majority of cases a technical problem, it is an economic one or, perhaps to be more correct, it is a pseudo-economic problem.

As I have already indicated, one denture of a full set cannot be satisfactory unless both function together, and the problem then is to make both satisfactory. Because the mandibular denture rarely has the same retention as the maxillary one, the greatest care must be taken in the designing of the mandibular one, and adequate time must be expended on its construction. Every single factor concerned with its stability must be studied and be given due consideration, and should any compromises be necessary as between the maxillary and mandibular dentures, all must be in favour of the latter.

I have made a statement that the problem is an economic one, and from this point of view I have often discussed the time and trouble required for successful denture construction with practitioners, the retort frequently being, "I cannot afford, for the fee I receive, to take the extra time that would be necessary to muscle trim my impressions; to check and recheck vertical dimension, centric and excentric relationships; to provide for balanced articulation, etc." This I counter by saying, "It is the responsibility of the dentist to provide the patient with dentures which will satisfy the requirements of aesthetics, phonetics, comfort, and utility." The last is the most important, i.e., the dentures must enable the patient to masticate his food with a reasonable degree of efficiency.

If this responsibility be recognised, then you must use all the knowledge and skill you possess and take whatever time may be necessary, so that you will insert dentures which fulfil the requirements, otherwise you are not carrying out your obligations as a professional man.

The fee charged the patient is the dentist's own individual business and should be in accordance with what he personally considers will compensate him for his time and effort and for the knowledge and skill he puts into the construction of the dentures. My point is that, irrespective of what fee is quoted, the dentist enters into a contract to do his best to supply satisfactory artificial dentures and the size of the fee has nothing whatever to do with the responsibility he assumes in making the contract. Further, however, I say that, irrespective of the fee, it pays dividends to spend whatever time may be necessary to make the dentures satisfactory without the necessity for undue time to be spent after the insertion of the dentures.

Let us suppose that to lessen the construction costs you take short cuts, perhaps when taking the impressions, or you use anatomical teeth and a plane-line articulator, or in some other way, well, you may have a patient who is very co-operative and who considers that wearing new dentures is like wearing a pair of new stiff shoes—he must be patient, suffer even a degree of inconvenience, discomfort, and maybe pain. Eventually he may learn to juggle with his dentures and chop his food sufficiently well to evade immediate digestive trouble, and as a result you get away with it! However, every now and then it will be found that a patient just cannot adjust himself to his dentures and there is trouble for both dentist and patient.

However, even the first type of patient (who does eventually learn to eat all over again and to chop his food) may have to come back again and again for adjustments, and often such visits occur just when you are in the midst of some intricate operation or difficult filling. This inconveniences you but you take a little off here and a little off there to relieve some sore spots, which little adjustment may spoil the dentures and lead to the necessity for the rebasing or relining of one or other of them. However, whether it comes to this stage or not, these visits are all time-absorbing and time means money.

Had all this time spent on adjustments after the insertion of the dentures been utilised when taking impressions, establishing vertical dimension, articulating the teeth, shaping the dentures and the like, an odd visit or two only

might have been necessary. Of course it is quite possible that the sum of the time spent in each of these suppositious cases might have been approximately equal, but there is a difference. In the case where considerable additional time had to be spent after the insertion of the dentures, it is quite conceivable that the patient would not have been pleased with the inconvenience, discomfort, and the irritation caused by the necessity for so many post-insertion visits. In the case where the additional time had been spent prior to the insertion and little post-insertion adjustments had been required, the patient would have been more inclined to sing your praises to friends and neighbours, resulting in new patient recommendations which actually constitute part of your reward —comfort in the first day or two is so impressive.

As an actual fact, however, in cases where considerable post-insertion visits and adjustments have been found to be necessary, more time may very easily have been absorbed than there would have been had an extra half hour been spent taking the impression and an extra hour in balancing the occlusion.

From an economic point of view I contend, and this may need some thought before you would agree with me, that the smaller the fee received for dentures the less you can afford to have your time broken by post-insertion visits for denture adjustments. Whereas, if you have charged a large fee, you could afford to spend any amount of time in adjustments.

However, there is still another aspect of this problem. Quite apart from consideration of fees or practice building, there is a personal, an inner satisfaction, in having rendered a satisfactory health service. Adequate remuneration is, of course, very important and there are no limits to the size of the fee deserved or earned when a really satisfactory service has been rendered, but if you can tell me you have never experienced a real feeling of pleasure in the knowledge that you have enabled some poor edentulous patient to prepare his food efficiently for digestion and thus increased for him the joy of living—then I say you have missed your vocation and that a commercial pursuit would have provided you with considerably greater opportunities for amassing a bank balance.

Up to this stage I have endeavoured to impress you with my belief that the problem of constructing satisfactory functioning dentures is an economic one—for while many men say they cannot afford to devote all the time necessary, I firmly believe that if practitioners would devote the necessary time, utilize some degree of skill, apply *all* their knowledge, and spare no pains to see that each and every factor concerned with stability be given full consideration, the majority of dentures would be satisfactory. It does pay to take the necessary trouble.

In the construction of dentures our objective is to make them conform to the requirements of:—

Aesthetics,

Phonetics,

Comfort,

Masticatory efficiency.

Freely admitting the importance of aesthetics and phonetics, I do not propose to discuss those aspects at all. Time will only permit me to deal with one aspect, namely masticatory efficiency, comfort of course being a necessary factor for I believe that the main, the most important, necessity as regards artificial dentures is the ability to masticate one's food, for health and in fact, life itself, is dependent upon that function.

I am, of course, quite aware that to many patients appearance is most important and that many female patients look upon dentists as just another type of beauty specialist, but it should not be difficult to impress upon such that all beauty aids fail, that cosmetics are valueless, if through indigestion their noses become red, and their skin loses its smooth texture.

Our text, then, is mandibular stability, and if all the factors concerned with stability are appreciated and applied successful dentures will usually result. Unfortunately I see so many mandibular dentures where not only one but several factors have been entirely ignored.

I am not going to outline any particular technique, for technique is not the main consideration—my talk deals with principles, for I am quite sure that equally good results can be obtained with any of several quite different techniques for securing impressions, registrations of jaw relations, or setting up, and the like. However, while I propose to deal with principles, I wish to do so in a practical manner and not merely theorise.

Before dealing with the principles involved, let me say that of course I realise that some mouths are more difficult to contend with than others, and that preparation at times of a surgical nature is necessary. It is not possible to discuss the conditions that require surgical correction so I must content myself with the general statement that I cannot for the life of me understand why it is that so often dental surgeons struggle with conditions about the mouth which complicate and make more difficult the construction of dentures when some, and frequently some very minor, surgical procedure would simplify the construction of the denture. It is therefore presupposed that in this talk we are dealing with mouths which are in a suitable condition for the reception of dentures.

Apart too from the question of physical difficulties, it is, I should think, quite recognised that the patients' temperaments and mental attitudes have a direct bearing on the prognosis. It is necessary therefore at times to attempt to alter their mental attitudes and to instruct them regarding the difference in the functioning of natural and artificial dentures and as to the part they must play in ensuring the success of their new apparatus. They must be told how and what to eat during the first few days or weeks after insertion. Unquestionably the success of any denture depends in no small measure upon the intelligent co-operation of the patient.

I find it very convenient for purposes of discussion to utilise the idea evolved by E. W. Fish[1], i.e., to consider a denture as exhibiting three surfaces:—(Fig. 1).

The polished,
The impression,
The occlusal.

1. Fish, E. W.—Principles of Full Denture Prosthesis, ed. 4, London, Staples Press, 1948.

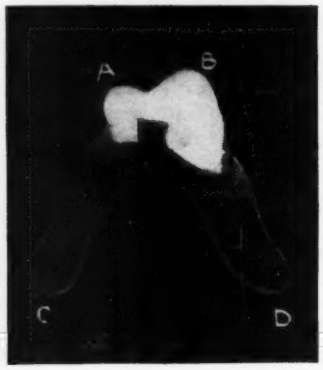

Fig. 1.—AC and BD: polished surfaces; CD: impression surfaces; AB: occlusal surface.

The polished surface includes the lingual and buccal surfaces of the teeth, the lingual and buccal surfaces and the periphery of the denture itself. The impression surface is that part of the denture derived from the impression. The occlusal surface is constituted by the portions of the teeth which contact during occlusion.

These surfaces will not be discussed in their order of importance, but in the order which lends itself to a more simple correlation. At the same time it must be understood that it is not possible to confine the discussion of any

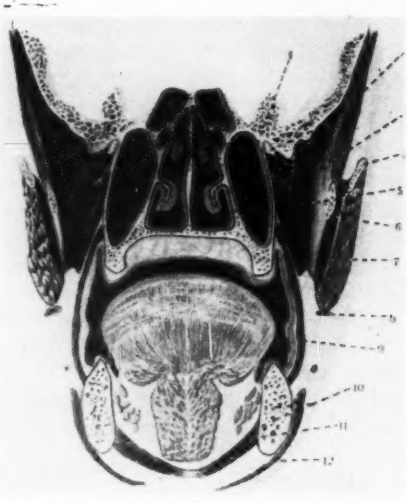

Fig. 2.—A cross sectional cut through the head but not quite vertical. It shows the potential denture space and it is obvious that the tongue and buccinator muscle will be in continuous contact with the polished surfaces of the denture in the molar region. (Diagram from Schlosser[2].)

of these surfaces to a watertight compartment. There will be overlapping, but in general I think it easier to discuss the individual factors which concern each surface.

The Polished Surfaces.

Figure 2 shows the potential denture space, i.e., the space to be occupied by the dentures. Hanau's[2] definition of denture space is:—"That space in the oral cavity which is bordered by the lips anteriorly, the cheeks laterally and the tongue interiorly, maxillary ridge and the palatal vault above, the mandibular ridge below, the lingual tissue attachment at the borders of the floor of the mouth and the palate, and by the continuation of the oral cavity posteriorly."

It will be seen in Figure 2 that the polished surfaces are almost entirely in contact with muscular tissues which are constantly on the move. These muscles can readily dislodge a denture which is incorrectly shaped, but they can exert a very definite and strong stabilizing, and in fact retentive, force on the dentures. Yet this large area of surface is not given much consideration by many dentists; in fact, all too frequently the shaping of the dentures is left to the technician, who has little or no idea of the anatomy of the parts.

You are all familiar with the fact that if a force be exerted against an inclined plane components of force may be resolved in any two directions at right angles to each other. (Fig. 3.)

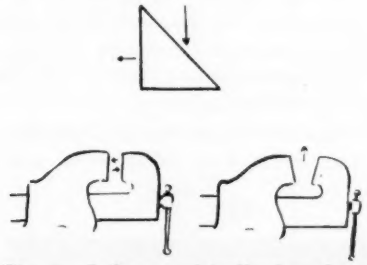

Fig. 3.—Influence of inclined surfaces.
Arrows in upper diagram indicate how a vertical pressure on an inclined surface will cause a component of force horizontally so that if a solid body with inclined surface were on a horizontal plane, pressure on the inclined surface would move the body along the horizontal plane. The lower diagram represents a vice—if jaws were parallel an object between the jaws would be gripped when they were brought together, but if the jaws diverged then the object would tend to slide out.

So, if we shape our mandibular denture so that its lingual surfaces look inwards and upwards, and its buccal surfaces outwards and upwards, we will have a denture triangular in cross section and consequently any lateral pressure on the denture from tongue and cheeks must tend to force the denture downwards against the supporting surface.

Let us imagine a case where a round, hard lolly is to be cracked between the teeth. If there were no auxillary muscles of mastication to hold the lolly between the teeth, owing to the fact that it is round, hard, and somewhat slippery, it would tend to slide out from between the teeth either into the

2. Schlosser, R. O.—Complete Denture Prosthesis, ed. 1, Philadelphia, W. B. Saunders & Co., 1939.

vestibule or on to the floor of the mouth. (Fig. 4.) But in fact, when we bite to crack such a type of food, consciously or unconsciously we do hold such in position between the teeth with the tongue and the cheek, and this lateral

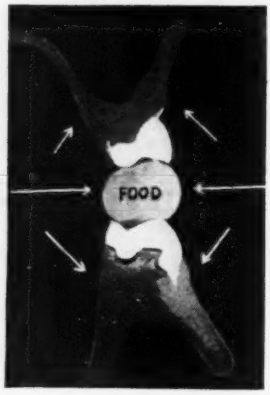

Fig. 4.—Horizontal arrows represent force exerted by tongue and cheek in holding food between teeth, the inclined arrows represent components of force which tend to seat the dentures in position.

pressure of the tongue on one side and the cheek on the other will, if the polished surfaces are correctly shaped, exert a component of force upwards in the case of the maxillary denture and downwards in the case of the mandibular denture, and thus exert a powerful stabilising force.

To obtain the maximum assistance from the muscles, the buccal flange of the denture from the bicuspid region posteriorly must be extended to the physiological limits. (Fig. 5.)

Fig. 5.—Typical denture—extended buccal flanges in the molar regions and narrowed in bicuspid region.

The buccal flange in the bicuspid region, instead of being extended, must be appreciably narrowed (so must the impression surface and the occlusal surface) otherwise the denture will be dislodged.

An extended buccal flange in the molar region not only enables the development of an inclined surface buccally, but it provides a surface on which the contracting buccinator can actually sit and assist in retaining the denture during masticatory effort.

Some practitioners do not appear to think that in the majority of cases comparatively large buccal extensions can be made. In practically all cases, however, they can for, even where the ridge has entirely vanished and there is a concavity instead of a ridge, the flange is still practicable as Figure 6

Fig. 6.—Diagram of a transverse section through the first molar region of a mandibular denture and mandible. D + A when the alveolus has been resorbed. M is the present shape of the mandible, A the part which has resorbed and D the denture as it would have been before resorption took place.
(Diagram from Fish[1].)

shows. The functioning of the buccinator muscle upon the buccal flange can be readily appreciated if the action of this muscle be understood.

The buccinator muscle has its origin in the pterygo-mandibular raphe and in portions of the maxilla and mandible. From this origin the muscle passes anteriorly and is continuous with the Orbicularis Oris M. Its upper fibres are continuous with the lower fibres of the Orbicularis Oris M. and its lower fibres with the upper fibres of the Orbicularis Oris M. (Fig. 7.) If the

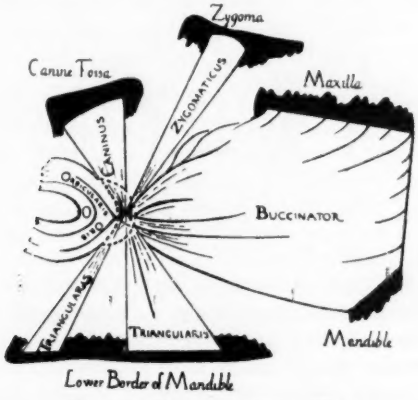

Fig. 7.—Diagram from Fish[1].

buccinator and orbicularis oris muscles were the only ones to be reckoned with, then every time the buccinator contracted it would pull the corners of the mouth backwards, but there is a series of muscles which cross and intercept the buccinator and orbicularis oris muscles at the angle of the mouth. They are the Levator Anguli Oris or Caninus (which arises from the canine

eminence) ; the Zygomaticus arising from the Zygoma, and the Depressor Anguli Oris or the Triangularis which originates from the lower border of the mandible.

All these muscles radiate out from the angle of the mouth as the spokes of a wheel radiate from the hub, and the meeting point is termed the "Modiolus". By contracting, these three muscles can fix the corner of the mouth so that the buccinator can contract without appreciably affecting the Orbicularis Oris or distorting the mouth. The lower fibres of the buccinator are somewhat flaccid and it is chiefly the middle fibres which are active in holding food in position during masticatory effort and which stabilize the dentures. "When the muscles contract to hold food between the teeth, they do not reduce the depth of the sulcus in the molar region as they do in the bicuspid region, they form a pouch in which a piece of food which has been cut off a large bolus can be stored or held while other food is being further triturated,"[1] e.g., if a child should be sucking a comparatively large, hard lolly, if he then be given a piece of cake, he can "park" the lolly in this buccal pouch while he eats the cake, chewing it quite satisfactorily. It is because of this comparative flaccidity and pouch formation that the buccal flange of the dentures can be extended to form the inclined flange previously mentioned.

It is the modiolus (Fig. 8) which can readily dislodge a denture if it be not narrow in the bicuspid region, which is close to the angle of the mouth. (This muscular action was shown by a short cine film.)

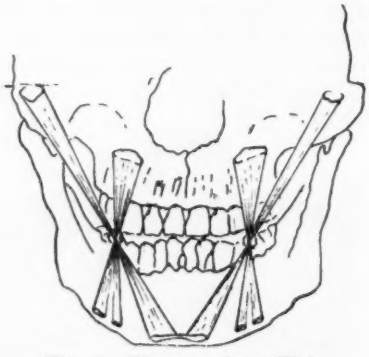

Fig. 8.—Diagram from Fish[1].

In this connection, while I strongly recommend the buccal extension to obtain the full benefit of muscular control, it is probably more important to narrow the arch of the teeth and the buccal flange of the denture in the bicuspid region than to extend the buccal flange as recommended.

Insofar as the lingual surface is concerned, it is of great importance that the unruly member, the tongue, should not be permitted to exert any dislodging upward pressure on the denture but that it be utilised to hold the denture in position.

It is therefore important that this surface should look inwards and upwards, then when the tongue exerts a lateral pressure on food it will exert its component of force downward. To accomplish this and at the same time keep the

arch and the buccal flange of the denture narrow in the bicuspid region, it may be sometimes necessary to grind the lingual surfaces of the 1st bicuspid teeth and to extend the base material laterally over the floor of the mouth. This latter procedure will form a very thick lingual margin and in fact it may form a definite lingual extension over the floor of the mouth. This extension is horizontal at the base and by its width it enables the inclined surface to look inwards and upwards so that the tongue can exert its downwards component of force while food is being triturated.

A common mistake frequently made is to make the lingual surface of the denture concave instead of permitting every portion of the lingual surface to look upwards and inwards. A concavity means portion of the surface will look downwards instead of upwards. The idea of making a concavity is to give more room for the tongue, but while it may give tongue room, when the tongue moves upwards it can easily dislodge the denture.

The periphery, or the denture margins, form part of the polished surfaces and it is of great importance that all margins be rounded and well polished so that the muscles may move about the margins without irritation or pain.

I cannot agree with some advocates[3, 4] of the mucostatic type of impressions who claim that the denture margins should be short and sharp, or razor edged. In the case of a flat, ridgeless mandible such edges could not be tolerated but, quite apart from this aspect, short, sharp edges would not permit shaping the denture so that it would be triangular in cross section which is so necessary for muscular control.

Unquestionably the shape of the polished surfaces of any denture can have a most marked effect upon stability and enable the patient with very little experience or practice with the denture to exert a definite and powerful control. Muscular control is a very important factor in denture retention and stability.

You have all seen patients who have worn dentures for many years and who tell you they can eat an apple and other types of food quite well, yet on examination it is seen that there is no fit owing to absorption, there is no balance in occlusion. What has happened, of course, is that over the period of years the patient has unconsciously trained his or her muscles to hold the dentures in place. Do not forget, however, that this long training of the muscles can be a menace. While over the period of years the patient has no doubt gained a control over the dentures, the constant overclosure when occluding the dentures will have resulted in the formation of lines and wrinkles which have given an appearance of undue age to the patient; but those same trained muscles will resent any great change being made when new dentures are constructed—new dentures of correct shape and made with greater distances between the occlusal and impression surfaces to occupy the now increased available denture space will be frequently most uncomfortable to wear.

3. Cunningham, W. J. & Pope, M. R.—Colloid muco-static impression technique for full lower dentures: Dentistry, 7:369, 1947.
4. Chartrand, B. O. & McGinnis, R. E.—The use of alginates for full denture impressions. Presented before the Col. State Dent. Convention, 1946.

If the first dentures a patient wears are properly shaped, the patient can without any long period of training hold the dentures in place because the normal contraction of the buccinator, plus the action of the tongue in holding food in place, will assist in stabilising the denture.

The Impression Surface.

Regarding these three surfaces we are discussing, let me make my position clear. I think the impression surface has the least effect on the stability of a denture and the technique of securing an impression is relatively unimportant. Of course a good impression is necessary, but I am very strongly of the opinion that the securing of a good impression does not mean a successful denture.

The following is a quotation from an article by Riddell and Davidson[5]:—"The object of this technique is to produce a retentive lower denture regardless of whether the ridge is good or bad or absent: a lower denture that will resist displacement by any normal muscular movement of the jaw, or upon placing an instrument between any of the teeth and pushing it, unless an excess upward force is used." To my mind, this is absolutely ridiculous, for no matter how good the impression, nor by what technique it is taken, if there be undue leverage on the denture or if there be cusp interference, or the polished surfaces be so shaped that muscular action can exert a disruptive force, the denture will be dislodged.

Ante[6] states, and with this I agree:—"In successful denture practice, aesthetics, exact centric relation and balanced occlusion all outrank the impression in importance, but a good impression is, nevertheless, an important step in denture construction."

Gillis[7] states:—"No system of impression making can succeed unless good articulation is established. No patient ever presents himself with soft flabby ridges unless he has worn dentures that are poorly articulated."

In my opinion one of the most important factors concerned with the impression surface is that the maximum tissue area be covered. This is important for several reasons:—

(a) It makes maximum use of any retentive force whether such be surface tension, adhesion, or atmospheric pressure;

(b) It distributes the load of mastication over the maximum surface.

(c) It enables the polished surfaces to be shaped to give maximum muscular control.

Figure 9 shows a denture typical of many that come under my notice. The occlusion was bad but, quite apart from that aspect, it is obvious that there would have been much greater stability had the denture covered the available area as marked on the cast.

5. Riddell, J. D., & Davidson, C. W.—The mucoseal technique for retention in full dentures: B.D.J. 86:90, 1949.
6. Ante, I. H.—Impressions of edentulous arches: Dental Survey, 23:1238, 1947.
7. Gillis, R. R.—J. New Jersey S.D.Soc., 20:36, 1949.

In this section of the paper I am not discussing technique, but I want to contravert some of the statements made in dental journals by advocates of the mucostatic impression methods. They make two claims with which I am in total disagreement—first, that there is no need to cover a large area[8], and second, that the margins of the denture should be made razor sharp[3,4].

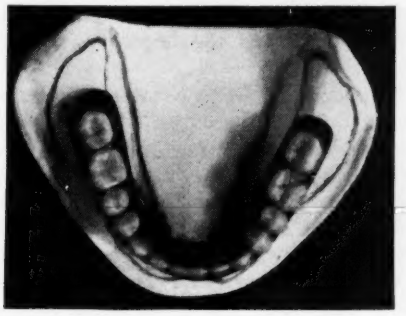

Fig. 9.

I believe that there are many techniques which will give equally good results—but I am sure that dentures covering small areas and not utilising a great deal of available area will not permit the maximum stability of the

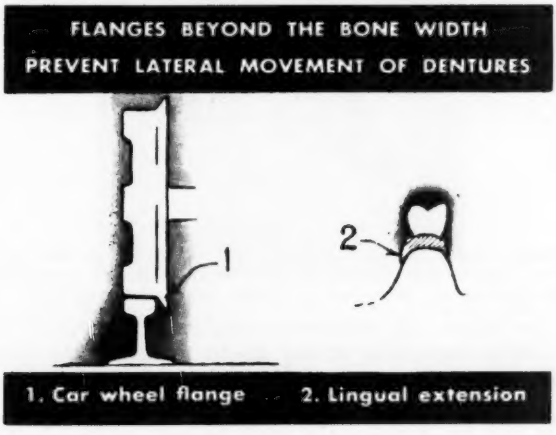

Fig. 10.—Diagram from Dykins[8].

denture to be obtained, no matter how good the retention. The load of masticatory force is confined to an unreasonably small area and it is not possible to shape the dentures to give full muscular control since such dentures do not, and cannot, provide buccal flanges.

8. Dykins, W. R.—Muscle trimming and mucostatic principles: Tic, March, 1949.

One writer[8] states that there is no need for any depth of flange except to prevent lateral movement of the denture, and he instances the case of the railway wheel flange (Fig. 10)—the flange being only necessary to keep the wheel on the rail, and he illustrates the mandibular denture with a very short lingual flange and practically no buccal flange—the drawing is obviously a cross section in the molar region. This is somewhat ridiculous, for what would be the result if such a case were made for a very narrow ridge? Think of the pressure on that narrow ridge and the impossibility of developing a buccal flange!

What particularly annoys me with advocates of this type of impression is that some of them appear to draw diagrams to suit their arguments and at times misrepresent conditions; in fact, some are quite stupid.

(At this stage several slides were shown which were made from illustrations from articles by writers who were advocating the mucostatic type of impressions, and it was obvious that some were drawn to suit the contention of the writers of the articles without any regard for the anatomy of the parts involved.)

Figure 11 is one example and surely no one has seen a section of a mandible in the molar region look like that. The whole width of the mandible from the mylohyoid ridge to the external oblique ridge is just the width of the molar tooth and that is rather extraordinary, and the distance the denture flanges

Fig. 11.—A ridiculous diagram from Dykins[8] with denture, tooth and mandible entirely disproportionate. The original legend said "Cross section of mandible and denture showing unnecessary extension of flange below the mylo-hyoid ridge."

extend below the ridges also equals the distance that there is between these ridges. It would be impossible in any mouth to extend the buccal flange so far below the external oblique ridge. A diagram such as this misrepresents conditions to bolster an argument.

Figures 12 and 13 illustrate the available area which should be included irrespective of the impression technique. In making such an outline on a cast —made from an over-extended primary impression—when a base plate is to be made for taking the final impression as in Terrell's technique[9], or when a tray preparation is used[10], the procedures would be as follow:—

9. Terrell, Wilfred H.—A precision technique producing dentures that fit and function: Aust.J.Dent., 55:100, 1951.
10. Tuckfield, W. J.—Full Denture Technique, ed. 2, Melbourne, Aust. College of Dentistry, 1945.

The buccal outline is commenced by including the distal end of the retromolar pad and making the line proceed along the buccal very close to the retromolar pad till the apex of the triangle is reached, for in this region the cheek

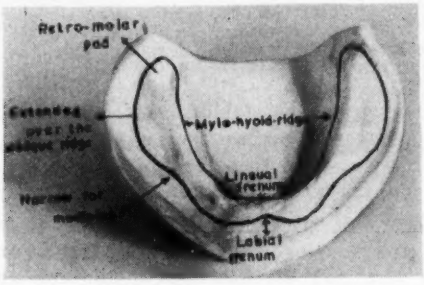

Fig. 12.

is closely attached. The line would then swing outwards even over the external oblique ridge to form the buccal extension for it is quite possible for the buccal extension to rest on some of the lower fibres of the buccinator; it would then narrow in the bicuspid region to be free of the action of the modiolus, then widen out again but narrow in for the labial frenum.

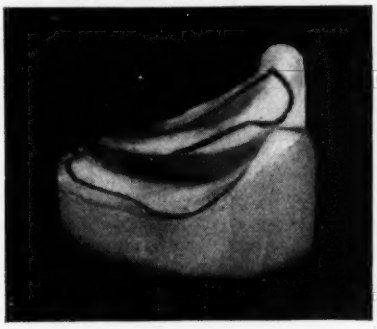

Fig. 13.—Same cast shown in Figure 12 but giving a better view of the lingual outline for denture.

On the lingual, the line can dip down to form a semi-circle below the retromolar pad coming up to meet the beginning of the mylo-hyoid ridge (Fig. 13). The line then would proceed along the crest of the ridge till it reaches its greatest distance below the crest of the ridge in the bicuspid region from whence it proceeds upwards to miss the sublingual gland. It then narrows to accommodate the lingual frenum. Some practitioners advocate the lingual flange passing varying distances below the mylohyoid ridge, but in general I do not think it advisable or necessary.

Before leaving this surface to discuss the next, I would say that as regards the mandibular impression, provided your technique permits you to utilize the whole available area and that you obtain a reasonably accurate surface fit to

the tissues, it does not matter what technique you use, nor whether your material be compound, plaster of Paris, one of the hydrocolloids, or a material such as muco-seal, nor whether you use controlled pressure or no pressure.

The Occlusal Surface.

Of the three surfaces of the denture I consider this, the occlusal surface, to be the most important.

During the discussion on the stability of the mandibular denture I have pointed out that the impression surface plays a part in obtaining stability, and that the polished surface does so to perhaps a greater degree. In one sense, however, it may be said, the occlusal surface does not play an *active* part in the provision of stability—but it can be, and frequently is, an unstabilizer.[1]

This surface is the working surface of the denture and no matter how strong the retention developed, nor how well shaped the polished surface may be, cusp interference associated with unbalanced articulation can unstabilize the denture. Whether or not it causes actual dislodgement, it certainly will cause tissue trauma, which in turn may lead to ulceration in localised areas and may cause uneven, and undue, resorption of the alveolar ridge.

Quite apart from the unstabilising effect of unbalanced articulation, undue leverage associated with the absence of unilateral balance can very effectively unstabilise a mandibular denture if and when food is being crushed on one side, so preventing any balancing contact on the other side. In fact, unilateral balance is perhaps just as important as balanced articulation or bilateral balance, or as it is sometimes termed "three point contact": this, because a patient can be trained, or he may accustom himself, to eat with an up and down, or chopping motion, and so function without bilateral balance. For this type of mastication, however, unilateral balance is a definite necessity.

The following are the main factors relating to the occlusal surface, all of which must be given serious consideration if the degree of stability and retention developed by our impression taking and the shaping of the polished surfaces, are to be maintained:—

1. The establishment—with a reasonable degree of accuracy—of the functional vertical dimension of the face which will enable us to establish the vertical dimension of the denture space.

2. The registration of correct centric relationship of the jaws.

3. The provision of unilateral balance which is necessary to maintain stability when the presence of food between the teeth prevents a bilateral balance of the occlusal surfaces.

4. The provision of bilateral balance, i.e., balanced articulation with a complete absence of cusp interference. This means that if cusped teeth are used an adjustable articulator will be necessary; but with flat plane or cuspless teeth, freedom from cusp interference can be assured without such an articulator.

5. Spot grinding and milling on the articulator subsequent to fabrication, irespective of the type of articulator used and whether or not a three point contact form of articulation be provided.

6. The possible use of carborundum paste for occlusion or articulation adjustment in the mouth subsequent to insertion.

7. The maintenance of balance by checking and possible adjustment at least once in every six months.

1. *The establishment of vertical dimension.*

I think we now have a better understanding of the importance of vertical dimension from the functional, aesthetic, and comfort points of view. However, the term vertical dimension is frequently very loosely applied for there are actually three vertical dimensions in which we are interested, yet at times the terms are used without qualification as if they were synonymous, which they are not.

So when we speak of vertical dimension we should make our meaning clear and indicate to which of these dimensions we are actually referring. There is:—

The true vertical dimension of the face;
The functional vertical dimension of the face; and
The vertical dimension of the denture space. (Fig. 14.)

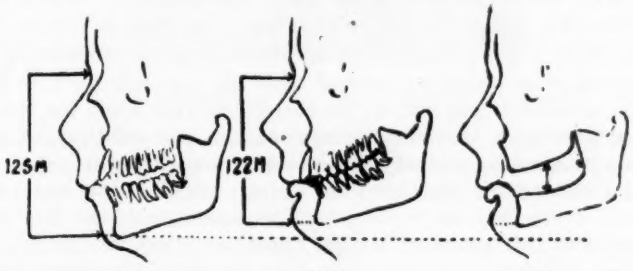

Fig. 14.—(a) True vertical dimension of face—mandible in rest relationship, lips lightly contacting, teeth not in contact.
(b) Functional vertical dimension of face—mandible in a functional relationship, teeth contacting, lips more tightly contacting. Dimension 3 mm. less than in (a).
(c) Vertical dimension of denture space. The mandible in centric relationship. The distance between the ridges when the mandible is 3 mm. closer to the maxilla than it would be if the mandible were in a functional relationship as in B.

From the functional viewpoint we are most interested in the vertical dimension of the denture space, i.e., the vertical distance between the mandibular and maxillary alveolar ridges, when the mandible is in its functional relationship to the maxilla.

The true vertical dimension of the face, or the true facial vertical dimension, is the length or vertical height of the face when the mandible is in its rest relationship to the maxilla.

The rest relationship of the mandible is the relationship in which all the tissues and muscles are relaxed to an extent counteracting the force of gravity only when the head is upright, or when the mandible is suspended by the reciprocal co-ordination of the muscles of mastication and the depressor muscles. When in this relationship, the lips are lightly contacting and the masticating surfaces of the teeth are separated by a space of 2-3 mm. It is the most comfortable position of the mandible and it is a non-functional position; all other

positions are functional. It is the position the mandible always assumes after swallowing or clenching the teeth for any other reason; in fact, all functional movements commence from and terminate at this rest position.

The rest position of the mandible is determined by the musculature and not by the teeth; it is established before the teeth arrive, and while muscles may lose tone or vary in activity, they do not lose length, therefore the rest relationship remains constant throughout life,[11, 12] and the rest position of the mandible is a most valuable landmark in the establishment of the vertical dimension of the face.

When the teeth are in occlusion, the vertical dimension of the face will be less than when the mandible was in its rest relationship, because the space that was present between the teeth when the mandible was in its rest relationship has been closed by the mandible's upward movement to make contact between the teeth—so the vertical dimension of the face must have altered, and lessened, and this lesser vertical dimension is termed the "functional vertical dimension of the face."

The difference in these two vertical dimensions of the face is, of course, dependent upon the magnitude of the space which existed between the teeth when the mandible was in its rest relationship; the space is termed "free-way space" and, while it varies in different people, it is on the average 2-3 mm.

In the case of an edentulous patient when his mandible is in its functional position, the alveolar ridges will be the correct distance apart for the dentures in occlusion, and when the mandible assumes its rest relationship, the teeth will separate to form the free-way space—which is most important for comfort, stability, and aesthetics. If, therefore, we can establish the rest position of the mandible we can measure the true vertical dimension of the face; from this we can determine the functional vertical dimension which will be 2-3 mm. less. We know that when the face has assumed its functional dimension, the vertical dimension of the denture space will be correct. Now, if we adjust the height of the occlusal rims so that they contact while the functional position of the mandible is maintained, these rims will constitute a record of the vertical dimension of the denture space.

It is of the utmost importance that we then take our registration of centric relationship of the jaws with this vertical dimension of the denture space maintained, and that this dimension be not altered during the construction of the dentures. The whole thing can be simplified if we first measure the true vertical dimension of the face, and this measurement can be carried out in several ways. A convenient method is to use a pair of callipers and measure the distance from some mark on the upper part of the face such as at the nasion, or the anterior nasal spine, and some selected spot or line marked on the chin. (Fig. 15.)

A patient can be made to assume his rest relationship in several ways which, since technique is not our story, we cannot discuss in detail, but a simple way, and reasonably accurate, is to have marks made on the face

11. Kazis, H.—Complete mouth rehabilitation: Aust.J.Dent., 55:8, 1951.
12. Thompson, J. R.—The rest position of the mandible and its significance to dental science: J.A.D.A., 33:151, 1946.

for measurement purposes and to ask the patient to say 1, 2, 3, K, L, M, several times and to instruct the patient to remain quiescent after completing the "M" sound. Then take a calliper measurement between the two marks, then make an

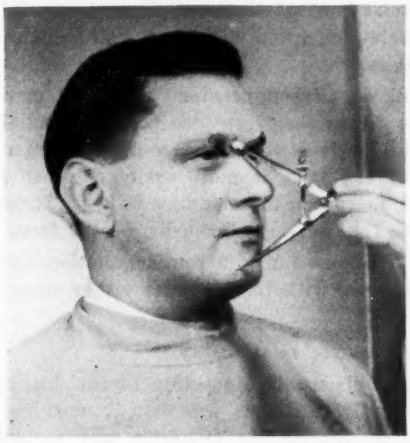

Fig. 15.—Measuring true facial vertical dimension.

additional mark on the chin 2-3 mm. lower down than the first mark. Now, if the patient closes his jaws until the callipers reach from the mark on the upper part of the face to the lower of the two marks on the chin, the functional vertical dimension will have been measured.

These marks on the face and the calliper measurement are retained. The base plates and occlusal rims are inserted into the mouth and the height of the rims is adjusted until the calliper points will reach from the mark on the upper part of the face to the lower mark on the chin. When this is accomplished we shall have the vertical dimension of the denture space registered and recorded by our occlusal rims, and the callipers and marks on the face will have completed their function. This dimension must be retained during the whole construction period of the denture, and when the teeth are set up to this dimension provision will have been made for the 2-3 mm. free-way space.

If the teeth are set up to the vertical dimension of the denture space which would exist when the mandible is in its rest relationship, there will be little or no effect on the patient's appearance, but there will be no free-way space and the teeth will be contacting which will cause muscular strain, chattering of teeth, and maybe a resorption of the ridge, but definitely a loss of muscular efficiency.

If the teeth are set with a vertical dimension of the denture space greater than that which would be the case if the space was measured with the mandible in its rest relation, appearance will be affected, there will be a stretching of the muscles with a strained look about the mouth, an increased tendency for clacking of the teeth, and undue leverage will exert an unstabilising effect on the denture. There will be also an increased loss of muscular efficiency.

There is a critical distance between the origin and insertion of muscles at which they can exert their maximum power during contraction. When stretched beyond this critical distance they lose power.[11] So, too, if the vertical dimension of the denture space were less than necessary with too great a free-way space, the muscular or masticatory efficiency would be lessened with a probable loss of muscular tone, and, of course, there would be an adverse effect on the patient's appearance.

Finally, regarding vertical dimension, when the mandible is in its rest position, the condyles are in their retruded position, and the closure from rest to the functional position is a simple hinge-like movement.[13, 14] A record of centric relationship of the jaws is more easily obtained if the jaws are the correct distance apart, i.e., when the mandible is in its functional position which is 3 mm. less than the true vertical dimension of the face.

It is, of course, recognised that a centric relationship of the mandible to the maxilla can be obtained with the mandible either above or below its normal rest position.

2. *The registration of centric relationship.*

I do not propose to discuss this question for no doubt you each have your own pet method. My only comments are that it must be recognised that for each and every vertical position the mandible may occupy in relation to the maxilla, there is a definite and separate centric relationship and that, of all the factors concerned with the comfort and stability of dentures, no other one is of greater importance.

3. *The provision of unilateral balance.*

I do wish to stress the importance of unilateral balance. It is quite obvious that when there is food between the teeth on one side of the mouth, there can be no contact of the teeth on the opposite side, therefore balanced articulation is not possible until the food has been at least partially crushed. If unilateral balance be not established, leverage will probably dislodge the mandibular denture. If balanced articulation, or bilateral balance, be not provided for in a set of dentures, the patient may be able to accommodation himself to chewing with an up and down, or chopping motion, but, if unilateral balance be not established, even this chopping motion will not be satisfactory, for which reason I feel that unilateral balance is so important.

The main factors concerned with unilateral balance are:—

(a) Teeth of suitable bucco-lingual width.

(b) The centring of the teeth over the ridges.

(c) The parallelism between the occlusal plane and the lower mandibular ridge.

(d) The occlusal surface of the teeth placed as close to the alveolar ridge as circumstances will permit.

(e) The provision of maximum tissue coverage by the denture.

13. Sicher, Harry—Functional anatomy of the temporomandibular articulation: Aust.J.Dent., 55:73, 1951.
14. Eberle, W. R.—A study of centric relation as recorded in a supine rest position: J.A.D.A., 42:15, 1951.

(a) It appears advisable in many cases that the bucco-lingual width of the posterior teeth should be less than that of the natural teeth. By using narrower teeth the load on the alveolar ridge is lessened and it is easier to place the teeth over the centre of the ridge without encroaching on the tongue space, and it is easier to maintain the lingual polished surface so that it looks upwards and inwards. (Fig. 16.)

Fig. 16.—Suggested width of artificial teeth as compared with natural ones.

(b) If the posterior teeth were placed inside or lingual to the ridge, no amount of vertical pressure could dislodge the denture, whereas if placed outside the ridge, the ridge would act as a fulcrum of the first class lever so that, when the food was being crushed on the one side, the opposite side of the denture could be levered from its supporting surface. (Fig. 17.)

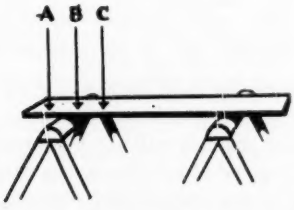

Fig. 17.—Represents a board laid across two saw-horses and is analogous to a mandibular denture. Force applied at A would tend to cause the board to lift from the horse on the right side, the saw-horse on the left acting as the fulcrum of a lever of the 1st class. Force acting at B would not tend to cause any lifting from the horse on the left but all the force would be received by the horse at the left. Force acting at C would not tend to cause movement in the board but the force would in part be received by the horse on the right.

(c) It is advisable where possible to have the forces of mastication directed at right angles to that portion of the mandibular ridge best able to resist such forces, i.e., the bicuspid-first molar region.[15, 16] To effect this the occlusal plane should be made parallel to this portion of the ridge. If the maxillary and mandibular ridges are parallel, and the occlusal plane is made parallel to both ridges, and particularly if flat plane teeth are used, then all masticatory forces would be directed at right angles to both ridges and both cases would be stable insofar as this particular requirement is concerned. (Fig. 18.) If the ridges

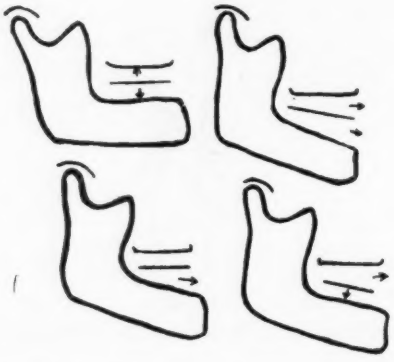

Fig. 18.—In these diagrams the upper line represents the maxillary ridge and the line between it and the mandible represents the occlusal plane. For mandibular stability the occlusal plane should be parallel with the mandibular ridge (in the bicuspid-first molar region).

are not parallel and the occlusal plane were made parallel to the maxillary ridge, the maxillary denture would be stable and the mandibular one would tend to be forced anteriorly from position. If in this case the occlusal plane were made parallel to the mandibular ridge, the mandibular denture would be stable and the maxillary denture would tend to be forced anteriorly, but this denture having better retention could resist this tendency. If the occlusal plane were not parallel with either ridge, then both dentures would tend to be dislodged. The alveolar ridges when not parallel act as inclined planes.

To make the forces of mastication be directed at right angles to the ridge is easy of accomplishment with non-anatomical teeth, but with anatomical teeth as ordinarily set up, the cusp inclines will—if a protrusive movement be taken—have components of force directed anteriorly in the case of the maxillary denture and posteriorly in the case of the mandibular denture. Whatever type of tooth is used, it still appears advisable to make the occlusal plane parallel with the mandibular ridge.

15. Sears, Victor—Principles and Techniques for Complete Denture Construction, St. Louis, C. V. Mosby Co., 1949.

16. Schwartz, M. M.—Some new conception of tooth forms and tooth arrangement: J.A.D.A., 17:1503, 1930.

(d) Even with the teeth set over the centre of the ridge, if the occlusal plane is any considerable distance above the alveolar ridge, there may be sufficient leverage to interfere with stability. Figure 19 illustrates the point

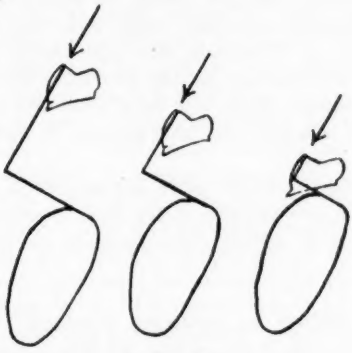

Fig. 19.

that the greater the distance between the occlusal plane and the ridge, the greater the leverage when anatomical teeth are used. It is a case of component of force when an inclined plane is opposed by another inclined plane.

(e) It must be quite obvious that the greater the area covered by the denture the more stable the denture will be when forces act.

4. *Bilateral balance or balanced articulation.*

You all understand what is meant by balanced articulation and those who use adjustable articulators in the endeavour to provide for balance are quite familiar with what is expected. Without apology I wish to state that in spite of its importance, I cannot stop to discuss it at length. I do say that with the use of cusped teeth balanced articulation is most difficult to obtain without the use of a fully adjustable articulator, and without this balance maximum stability of the mandibular denture cannot be obtained. Failing the use of such an articulator the two suggestions I would make are: make sure of unilateral balance and endaavour to train or have your patient practise mastication with a simple up and down motion, and possibly use a non-anatomical posterior tooth.

I have little or no hesitation in saying that if you use cusped teeth without an adjustable articulator, you should use a cheaper form of tooth, i.e., a tooth with flatter cusps or possibly teeth of acrylic resin; these latter admittedly wear with use and changes in vetical dimension are more rapid because not only may the ridges lose height by resorption of bone, but the teeth lose height by wear. However trauma is lessened and as the wear takes place, balance and stability tend to improve even if the life of the denture be shortened.

Finally, I think that if you are not using an adjustable articulator you will get better results by using non-anatomical teeth.

5. *Paste grinding and milling in on the articulator.*

Whether or not balanced articulation be attempted, it is of the greatest importance that, subsequent to the fabrication of a denture, grinding in of the occlusion be carried out for, no matter how carefully the teeth are occluded on the articulator, dimensional changes owing to shrinkage during fabrication, whether denture be vulcanite or acrylic resin, will take place and grinding in is necessary to correct any change in the position of a tooth or teeth. If anatomical or balanced articulation be not provided, it is essential that when the patient occludes in centric there will be a close and even contact of all the teeth and a Dox grinder is a very valuable adjunct in such cases.

6. *The possible use of carborundum paste subsequent to insertion.*

In a number of cases, irrespective of the care in setting up and grinding in on the articulator, the use of carborundum paste in the mouth will improve the articulation.

7. *The maintenance of balance by periodical checking.*

It is fully recognised that dentures will not retain their balance over a long period of years as resorption of the ridges takes place with the loss of supporting tissues, and the jaws must move closer together to contact, consequently the mandible must assume a more protrusive relationship, so centric will no longer be accurate.

Grinding in is necessary from time to time if balance with freedom from cusp interference is to be maintained.

My final statement then is that if all the factors concerned with the development of the three denture surfaces are given due consideration, the problem of the mandibular denture as part of a full set of dentures will be, if not entirely eliminated, at least very considerably reduced. However, there are quite a lot of factors, and unfortunately so many dentures which are failures give evidence that not one, but several, of the factors have been disregarded, and in such cases failure is not due to the denture being a specific problem but due to a lack of care on the part of the practitioner.

So I come back to my earlier statement: it is for the most part an economic and not a technical problem.

RAPID FABRICATION OF ORTHODONTIC RETAINERS*

ROBERT Y. NORTON, M.D.S. (SYD.).

INTRODUCTION.

This paper is intended to bring before you the use to which polystyrene can be put in the making of orthodontic retainers. To the best of my knowledge polystyrene was first used for orthodontic retainers by Dr. Earl Renfroe, of the University of Illinois, some 3 to 4 years back. At the time I was in America he had just given a series of clinics on this method of making retainers and many men were starting to use this material to make retaining plates. The interest aroused by these clinics and subsequent reports was quite appreciable, as this method could be seen as a great saver of both time and labour. Unfortunately I only had the opportunity of speaking to two men who had been using the polystyrene for any period of time and at that early stage they had no adverse comment. As to how widely used and how successful these retainers have been in the U.S., since then, I have very limited reports.

After a series of enquiries the necessary polystyrene in sheets $\frac{3}{32}$in. thick was obtained and a number of retainers were made from this material. I feel that polystyrene can be applied to very many uses in dentistry; for instance, in Orthodontics alone, apart from retainers, it can be used for oral screens and chin caps.

The main advantage of retainers made from this material is the rapidity and ease with which they can be produced. Only about one hour is required from the time of taking the impression to the insertion of the appliance, against some 2½ to 3 hours for the retainer made from the usual acrylic. Although it is not a practice to insert a retainer so soon after band removal, the time factor is of great importance in many ways.

THE MATERIAL.

Polystyrene is a hard crystal-clear plastic which for our purpose is bought in a sheet $\frac{3}{32}$in. thick. It has unlimited colour possibilities and is resistant to acids and alkalis.

Polystyrene is the polymerized form of styrene which, together with the acrylics and vinyls, are the three plastic denture bases of today. This synthetic resin is obtained from ethylene and benzine, whilst its chemical formula is very similar to methyl-methacrylate.

Styrene	Methyl-Methacrylate
$CH_2=CH.C_6H_5$	$CH_2=C.CH_3.COOCH_3$

Although this resin has been known for over 100 years the difficulties in manufacture have prevented its commercial use whilst its readiness to polymerize due to heat, light, etc., has presented many problems.

IDENTIFICATION.

This simple method of identifying polystyrene is worthy of note. Hold the material in the flame and it burns to a black, hard, shiny mass giving off a characteristic thick, black, sooty smoke; methyl-methacrylate burns with no soot and a very clear flame.

*Read at the Twelfth Australian Dental Congress, Sydney, August, 1950.

Physical Properties.

In place of giving a list of the properties of this material, I intend to compare it with acrylic resins in respect to the requirements of a base material for orthodontic removable retainers. An ideal base material should have those properties listed in Table I.

TABLE I.

	Methyl-Methacrylate	Polystrene
Ease of manipulation	2-3 hours to complete retainer	¾-1 hour to complete retainer
Sufficient strength to resist distortion due to mastication at mouth temperatures	Good	From figures available slightly superior in all respects, especially in respect to dimensional changes under mastication
Easy to repair	Yes, but subject to warpage	Can be repaired the same as methyl but quicker to make a new plate
Should fit the mouth accurately	Tends to shrink away from model	No figures available but would probably shrink more away from model
	Both types of retainers fit sufficiently accurately for practical purposes	
Colour and its stability	Pink to clear and is stable	Clear and has a slightly greater tendency to cloud
Odour and taste	Both appear to be satisfactory in this respect	
Impermeable to saliva and bacteria	Water solubility 0.45%	Water solubility 0.05%
Tissue tolerance	Excellent	Excellent
Bench life	Good	Good
Brittleness		More brittle
Surface hardness (Rockwell Scale)	70	80
Heat distortion	Distorts at 150°F.	Distorts at 175°F., 165-200°F.

From Table I it appears that polystyrene is superior in nearly all properties to the other acrylic resins with the exception that it has a slight tendency to brittleness.

Equipment and Materials.

(a) A stand on which to place the model so that the flame can be directed from below when required. (Flask.)
(b) A pressing block which has a flat surface of about 4in. square and can be readily grasped in the hand. (Glass slab.)
(c) A piece of sponge rubber 4in. square and ½in. thick—this is easily obtainable from wife's or mother's kneeling pad.
(d) A piece of high heat impression compound from which a form is made to help adapt the material into the vault of the palate.
(e) Cellophane which acts as a separator.
(f) A piece of polystyrene $\frac{3}{32}$in. thick and 3in. square.
(g) Bunsen burner or a Grunberg blowpipe.

Wiring, Securing and Retention.

Preparation of the case for making the retainer.

The model should be cast in stone, as the maximum strength to prevent tooth fracturing during pressing is essential.

Wiring—The number and variations of retentive and active wires is not restricted in any way, although from practical experience it seems that, if any great number of auxiliaries are to be used, retainers made of methyl-methacrylate are to be preferred. The wiring presents two problems not encountered in other methods of making retainers:

(a) Securing of the wirework to their correct positions during processing: and

(b) Retention of the wires in the plastic.

(a) *Securing the wirework*—Retaining wires on molars, premolars and cuspids fit about the teeth sufficiently well not to require any method of fixation. An anterior wire (about 4 or 6 anteriors) is best held in place by separating wire which criss-crosses this wire and passes at the back of the model into a groove which prevents further slipping. Auxilliary wires such as loops, finger springs, etc., are secured by cementing to the model—it is essential to protect with cement any part of a wire which is not to be encased by the plastic.

(b) *Retention of the wires in the plastic*—Regardless of what wiring is used that portion of the wire which is to be embedded in the plastic must be kept free (by $\frac{1}{16}$in.) from the model, so as to allow the material to enclose it completely. To ensure that the wire remains clear, the free end is bent at right angles so as to contact the model surface. Do not make the retention end excessively long as it is not necessary, and during pressing a great length of wire tends to be bent down on to the model, therefore not allowing the plastic to flow underneath.

When heavy molar retaining wires (.035in. or more) are used, it is best to flatten that part which is to be embedded in the plastic, otherwise the plate may be weakened at that point due to the excessive bulk of wire.

The palate form or "boat."

To ensure the adaptation of the polystyrene to the palatal vault, a piece of high heat compound is moulded so as to force the material into the vault during the pressing operation. This form is not completely adapted to the palate but is made to allow $\frac{1}{4}$-$\frac{1}{2}$in. clearance from the model while the top finishes level with the gingival margins of the posterior teeth. These forms can be made up in a batch to fit almost any average model—in which case they are duplicated in lead or carved from wood.

Method of Processing.

The case is wired according to requirements and to the method previously mentioned. These wires are then secured in place by some method which is most applicable to the particular case. The 3in. square of plastic is placed on the cast and with a sharp instrument the outline of the labial surfaces of the teeth is marked. The square is heated and trimmed along this line with shears.

If the excess plastic is left it would prevent the hot polystyrene from sagging into the palate vault. If a bite plane is to be incorporated the excess polystyrene in the anterior portion is not cut back but later folded over to increase thickness behind the upper anterior teeth.

The cast is placed on the support on a firm bench. It should be noted that the cast should have been soaked in water so as to be dampened to the stage of a freshly poured model. This degree of dampness is very important as it acts as a separator between model and plastic.

With the bunsen burner the plastic is heated with the flame directed mostly from below and into the vault of the palate. Although this area is the main point for the heat, the flame must be used as a "brush" over the whole plastic sheet otherwise there will be a tendency to burning.

When the plastic has freely and under its own weight sagged into the palate (this freedom of sagging assists in maintaining uniform thickness in the palate and if the plastic is forced into this area it will be thinned and possibly holed) the flame is passed over the top surface of the material so as to heat it evenly. The flame should be concentrated for a longer time on the "wires" so as to heat them slightly. This is necessary to allow the plastic to flow freely about them.

While the plastic is being heated the material will appear to "boil"—in other words it will assume an aerated look throughout its mass. At this point very little more heat is required and care must be exercised so as to prevent surface burning. The flame is kept moving quickly so that the whole area will reach its flash point simultaneously; as this is reached the flame is laid aside.

On the heated plastic the following are placed in order:—

1. A sheet of moist cellophane—this has been perforated to allow the escape of any surface gases and steam.
2. The 4in. square of rubber pad—this acts as the main counter die with which the plastic is pressed out.
3. The "boat" in the centre of the palate.
4. The pressing block.

With a firm grip on the pressing block a downward force is exerted on the assembly and held steadily in place for 2-3 minutes. This is sufficient time to allow the plastic to flow into the palate details and about the wires. It is then cooled in a water bath still under a holding pressure.

The assembly is taken from the water and the cellophane peeled off the plastic, which should have a clear, smooth surface. A detailed examination will show whether the plastic has accurately recorded the palatal and gingival details. If one is not satisfied in the adaptation it is permissible to replace the plate on the cast (if this has not been damaged) and reheat the plastic, concentrating on the deficient area and repeating the pressing procedure.

The pressed out plate is prised from the model and if this has been at the correct degree of dampness it will present a reasonably clean surface. The extra "flash" can be trimmed off by using a large, coarse stone or a hack-saw. It takes only 5 minutes to trim the plate to the stage where it is ready for pumicing. The retainer is then polished in the same way as other plastics—better results are obtained with the lathe running at only medium speed.

ANNEALING.

The original sheet of polystyrene has been annealed by the manufacturer, and it is in this stage when we start to heat the plastic. During the pressing out of the retainer there will be created within the plate many lines of stress which are potential points of weakness and eventually of fracture. To remove these, the trimmed and polished plate is suspended in the water bath at 150°F. for 20 minutes and allowed to cool slowly—this temperature will not cause any distortion.

Polystyrene retainers appear to stand up to practical use just as adequately as other type retainers. From observations they are satisfactory with regard to their fit, lack of distortion, colour stability, no tendency to taste or smell, and tissue tolerance. It is not desirable to have to repair these retainers; it is better to make a new one. Although admittedly more brittle than the conventional retainer the percentage of breakage is not much greater.

More recently I have been making oral screens from this material and have had gratifying results over six months. It takes less than 20 minutes to make a screen.

I have used some 20 odd retainers which have been made in this way. From this small sample I am, up to now, satisfied with the material but it does have a tendency to split. This was noted mostly in the region of the molar wires and for that reason I now flatten these wires, which appears to have reduced this fault. Most of these plates have seen more than six months' service and are still being worn. Five showed signs of splitting or else split, as suggested above, and have been replaced. The remainder have done their job and have been relinquished. Two of these, which were among the early ones made and were worn all the time for over 9 months, appear to be satisfactory.

From present observations it would seem that the next step is to endeavour to reduce the tendency for the material to split about the wires. If this cannot be done then another series of problems present themselves. Also the field of oral screens and chin caps would appear to offer a wide scope for the use of polystyrene.

MYOFUNCTIONAL THERAPY AS AN ADJUNCT TO ORTHODONTIC TREATMENT*

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In 1906 Dr. Rogers read a paper in which he made reference "to inducing every organ to perform the normal degree of functional activity."

In 1918, after studying many cases, he published the first paper on the subject "in which the idea of functional activity as an adjunct to our general treatment was employed"[1].

It was Dr. E. B. Lischer in 1933 who suggested the term "Myofunctional Therapy," which was immediately adopted[2].

Myofunction is muscle function.

Myofunctional Therapy may be defined as the treatment of malfunctioning muscles by the development of proper muscular tonicity and the establishment of normal muscular function of the facial muscles. This is achieved by means of suitable corrective exercises.

This presentation stresses the importance of these exercises in the prevention of malocclusion, as a part of corrective treatment and during the retention period.

It is hoped that the orthodontist, who is already prescribing appropriate exercises as a part of his treatment plan, may find something of interest and that the general practitioner may be influenced to look more closely for faulty muscular habits and to suggest the need for some preventive treatment for his patients.

Rogers was the first to call attention to the profound effect that the facial musculature exerted upon the growth of the jaws. The development (differentiative growth) of the face takes place chiefly between the third and the eighth week of embryonic life and thereafter the facial part of the skull increases in size as the result of growth of the facial bones aided by the growth of the cranium and the base of the skull. The post-natal skull growth is influenced considerably by function, and a diminution in function of the facial muscles, or a malfunctioning of these muscles, results in a diminution or asymmetry in the growth of the jaws and other bony parts of the face[3].

The muscles of mastication develop a high state of tonicity when given normal function with hard, bulky foods but when they lack this function the muscles tend to be soft and underdeveloped.

It is interesting to note that, in tests carried out by Waugh on different muscle groups, severe muscular weakness was found to be associated with underdeveloped jaws while muscular strength was almost always associated

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1. Rogers, A. P.—Internat.J.Orth., 4:555, 1918.
2. Rogers, A. P.—Internat.J.Orth., 21:426, 1935.
3. Salzmann, J. A.—Principles of Orthodontics, Philadelphia, J. B. Lippincott Co., 1943, p. 107.

with well developed jaws and faces[4]. Muscular pressure, acting through the occlusal inclined planes of the teeth, promotes the forward and lateral growth of the denture, called by Angle the "anterior component force"[5]. Rogers, appreciating that normal muscular function, in most cases, meant normal structural development of the jaws and face, stressed the importance of exercises to correct faulty facial posture and muscular malfunction.

These muscle exercises have a definite place in the correction of incipient muscle habits. If the faulty habit can be detected early and muscle exercises instituted the development of a malocclusion will be avoided.

In many cases of malocclusion there are opportunities for preliminary muscular treatment prior to the application of an appliance. Often during the later mixed dentition stage, when it is advisable to wait for a suitable time to commence appliance treatment, corrective exercises help to prevent the malocclusion from becoming progressively worse and, in some cases, tend to bring about improvement in the condition[6].

Whatever appliance therapy is used, the correction of the faulty muscular habit should be carried out at the same time. This retraining and development of the abnormal muscles aids the mechanical treatment and materially shortens both the treatment time and the retention time.

The mechanical correction of the malocclusion is, alone, seldom sufficient to ensure a stable result, because it seldom brings about correction of the habit. If the abnormal habit is not corrected during treatment its persistence will produce a relapse towards the original malocclusion despite a prolonged period of retention. On the other hand, when the correction is brought about with the aid of myofunctional therapy, there is often no need for any form of mechanical retention.

Another important benefit derived from the correction and development of the faulty muscles back to a healthy and vigorous condition is the improvement in personality and attractiveness of the patient.

In planning treatment for a case of malocclusion the following factors should be given consideration:—

1. Appliance treatment to establish arch form and remove abnormal occlusal interferences which tend to restrict normal muscular function.
2. Corrective exercise to establish muscular balance. Normal functioning of the muscles is necessary to avoid relapse after appliance treatment and retention.
3. Correct nutrition is essential. Osteoclastic and osteoblastic activity, which produce resorption and apposition of bone during tooth movement, cannot proceed normally where the necessary minerals and other food elements are lacking in the blood stream. Malnourished or undernourished children are less responsive to treatment and are unfavourable subjects for orthodontic correction. The patient should also observe the general rules of health—regular meals, adequate rest and personal cleanliness. A tired child is not a healthy child.

4. Waugh, L. M.—J.A.D.A. & Dent.Cosmos., 24:1640, 1937.
5. Strang, R. H. W.—A Textbook of Orthodontia, ed. 2, Philadelphia, Lea & Febiger, 1943, p. 66.
6. Rogers, A. P.—J.A.D.A. 23:66, 1936.

4. Any habits of an aetiologic nature, or any habits that may cause interference with treatment, should be detected and must be checked before treatment can be accomplished successfully.

Thus it is seen that myofunctional therapy is not intended as a substitute for, but rather as an adjunct to, all other factors involved in the treatment of a case[7].

Visualisation of muscular function in normal occlusion and in malocclusion will emphasise the myofunctional deficiencies encountered in the latter. It must be realised that no single muscle or group of muscles is exercised without affecting the adjacent muscles. The names which are given to the different exercises serve to indicate only the principal muscles involved in the particular exercises.

Muscles of the Face—Profile.

The principal muscles here are the muscles of the lips.

The Orbicularis Oris consists of numerous layers of muscle fibres surrounding the oral fissure. Some of these fibres come from other facial muscles which are inserted into the lips; others are fibres of the lips themselves. The orbicularis oris causes compression of the lips. The retentive value of a well developed muscle is obvious. Other muscles inserted into the orbicularis oris and concerned in its function are:—

The Buccinator, which is the muscle coat of the cheeks. It arises from the maxilla and mandible and passes forward to the sides of the mouth where it is inserted. It draws the corner of the mouth laterally, pulls the lips against the teeth and flattens the cheek. The buccinator aids in swallowing, whistling and blowing wind instruments. It aids in mastication by keeping the cheeks firmly in contact with the teeth and thus prevents food from being pocketed between the teeth and cheek.

The Quadratus Labii Superioris, which has its origin in the root of the nose and is inserted into the alar cartilage and the upper lip. This muscle raises the upper lip; the angular head also raises the wings of the nose.

The Quadratus Labii Inferioris, which has its origin in the mandible below the canine and premolar teeth and is inserted into the lower lip. It draws the lower lip downwards.

The Incisivus Labii (inferior and superior) have their origin near the maxillary and mandibular canine and lateral incisor teeth respectively, and are inserted into the orbicularis oris. These muscles draw the corners of the lips mesially.

The Zygomaticus has its origin at the zygomatic bone and is inserted into the orbicularis oris. It raises the corner of the mouth and draws it laterally.

The Caninus has its origin in the canine fossa of the maxilla and is inserted into the orbicularis oris muscle. It raises the corner of the mouth and draws it mesially.

7. Rogers, A. P.—Am.J.Orth. & Oral Surg., 25:1, 1939.

The Risorius has its origin in the subcutaneous tissue over the parotid gland and is inserted superficially at the corner of the mouth. It draws the corner of the mouth laterally.

The Triangularis, which has its origin in the mandible below the canine, premolar and first molar teeth and is inserted into the orbicularis oris. It draws the corner of the mouth downward.

The Platysma Muscle.

The Platysma is a thin quadrilateral sheet which arises from the superficial fascia and skin over the upper pectoral and deltoid regions and extends upwards over the side of the neck. It is directed upwards and forwards, and is inserted into the lower border of the mandible, becoming connected with the Depressor Labii Inferioris and the Depressor Anguli Oris muscles. The platysma retracts and depresses the angle of the mouth. It depresses the mandible, but only against resistance.

The Pterygoids—External and Internal.

The External Pterygoid has two heads and two places of origin: the upper head originates from the pterygoid plate of the great wing of the sphenoid and the squama of the infratemporal crest; the lower head originates from the lateral surface of the external pterygoid lamina. The heads converge as the muscle goes backward and slightly outward; the upper head is inserted into the capsule of the temporomandibular joint at the interarticular disc; the lower head is inserted into the anterior surface of the neck of the condyle of the mandible. The external pterygoid muscles acting together open the mouth and pull the mandible forward and downward. If used unilaterally, it draws the mandible sidewise.

The Internal Pterygoid has its origin in the pterygoid fossa and adjoining maxilla, and is inserted into the medial surface of the ramus of the mandible. These muscles acting together draw the mandible upward and, if used unilaterally, the internal pterygoid draws the mandible sidewise.

The Temporal and the Masseter Muscles.

The Temporal has its origin in the temporal fossa of the temporal bone and is inserted into the coronoid process and medial surface of the ramus of the mandible. These muscles raise the mandible.

The Masseter has two heads—a superficial head which has its origin at the anterior two-thirds of the zygomatic arch, and a deep head which arises from the posterior and middle parts of the zygomatic arch. Both are inserted into the lateral surface of the ramus of the mandible. The masseter muscles raise the mandible and draw it forward. The superficial fibres are used in incising. The whole muscle, in addition to the temporal muscle, is used in forceful contact of the molars.

The Tongue.

The tongue is a mass of interlacing bundles of striated muscle derived partly from the extrinsic muscles of the tongue and partly from the intrinsic muscles. It is active in speech, mastication and swallowing. Even at rest in the mouth it exerts an outward pressure on the crowns of the teeth and helps determine the shape of the arches.

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8. Strang, R. H. W.—*Op. cit.*, p. 137.

Nasal and Mouth Breathing.

Under the heading of environmental causes of malocclusion those habits that are a perversion of normal functional processes may be tabulated as follows[8]:—

(a) sucking habits;

(b) mouth breathing;

(c) abnormal swallowing habits;

(d) abnormal speech habits. Other abnormal muscle habits such as muscle tics or habit spasms and habits of the tongue, lips and cheeks.

The tonus of skeletal muscles is controlled by the central nervous system. In the infant the muscles remain flaccid until the motor centres of the central nervous system, by gradual maturative processes, bring about co-ordination and control of the muscles.

This co-ordination and control is aided by increasing function of the various muscles.

Some cases of mouth breathing and other abnormal sucking, swallowing and speech habits may be due to lack of development of the central nervous system as seen in certain subnormal or mentally retarded children.

As mouth breathing is the commonest of these perverted muscle habits and is one that produces a deformity of the hard and soft tissues, it will be described in some detail.

It is a habit that is very prevalent and the cause of a large percentage of the cases of malocclusion seen by an orthodontist. Apparently it may originate from a variety of causes, such as following on the correction of thumb or finger sucking, from a chronic cold, nasal blockage due to various causes, enlarged tonsils or even imitation of another person. It produces a typical deformity. The degree of deformity it produces depends upon the age, duration and severity of the habit.

In mouth breathing the deformity of the hard and soft tissues is brought about by an upset in the muscular balance. The mandible is lowered, there is extra tension in the cheek muscles, the tongue is drawn down from its usual position and, the force it exerts upon the upper arch being absent, a narrowing of the arch takes place with the palate high and V-shaped. The soft, non-functioning, and short upper lip offers no restraint on the crowns of the maxillary incisors and actually tends to tip them labially by causing an increased pressure on their roots towards the lingual. The lower lip, lying lingual to the crowns of the upper anteriors, increases this labial inclination.

Pressure of the lower lip also moves the mandibular incisors lingually, often elevating them. This elevation and posterior thrust on the mandibular incisors causes intrusion of the mandibular bicuspids[10].

10. Dewell, B. F.—Am.J.Orth. & Oral Surg., 27:469, 1941.

Typical Faces of a Mouthbreather.

A flat face due to underdevelopment of the nose and premaxillæ.
Narrow or slit-like nares.
Short hypotonic upper lip.
Maxillary anterior teeth labially inclined.
Full and hypotonic lower lip lying under the upper incisors.
Deep mento-labial sulcus.
A puckering of the chin whenever the patient tries to close the lips.

Mentalis muscle: insertion into chin.

This puckering is brought about by the abnormal contraction of the mentalis muscle in the effort to approximate the lips by raising the lower lip to meet the short upper lip.

In an excellent article on "mouth-breathing, its prevention and treatment," Thornton Taylor considers "the functionless hypotonic upper lip to be the most persistently perverse factor operating to continue mouth-breathing" and mentions the need for muscle education in eliminating the habit[11].

A Normal Face.

Here, it will be noted, there is a well developed nose, with rounded nostrils, lips properly shaped, no labial sulcus and no puckering of the mentalis muscle with the lips closed—an attractive and pleasing child's face.

A Daily Schedule for the Establishment of Normal Lip Closure.

So great has been the percentage of mouth breathing cases encountered in practice that a typed list of instructions has been prepared. This is called a daily schedule for the establishment of normal lip closure[12].

1. *Remember*—The patient should endeavour by self-reminding to keep the lips closed and breathe through the nose at all times.
2. *Reminder*—A silent signal arranged between the parents and child serves as a constant reminder to the child when he does not remember to keep his lips closed when relaxed. (This signal elminates the "nagging" effect sometimes produced by the spoken word.)
3. *Card*—A piece of cardboard, 1 x 1½in., held between the lips while reading, listening to the radio, doing homework and at other odd times during the day, is helpful in keeping the lips closed for a certain number of hours each day.
4. *Lip Exercises*—

   A. Blow under the upper lip and hold under tension to a slow count of four. Repeat this 25 times, four times each day.

   B. Draw upper lip down over upper anterior teeth and hold under tension for a count of ten. Repeat this 10 times, four times daily. Begin by alternating this exercise with exercise A. When the lip becomes less easily fatigued both exercises A and B may be undertaken.

11. Taylor, A. Thornton—South African Dent.J., 1947.
12. Fisk, G. V.—Am.J.Orth. & Oral Surg., 33:793, 1947.

5. *Tape*—Tape the lips at night, using two 2½-3in. lengths of about ½in. wide cellulose tape in the form of an X.

It is very necessary that no mouth breathing occurs for the eight hours or so at night when the patient is asleep, otherwise the efforts during the day are unavailing.

The difference in the action of the muscles between normal respiration and mouth breathing is explained briefly to the parent and patient, using articulated models. The signs and symptoms are pointed out and advice given to help overcome the habit. A copy of the schedule is given to the parent for reference. The exercises are varied to suit the particular case. In this way some practical help can be given to prevent the case from becoming progressively worse, where it is necessary to wait for a suitable time to start treatment. In many cases partial self-correction is brought about and the time of active appliance treatment shortened.

Positive instructions along these lines, given at the commencement of appliance treatment, helps the patient and parent appreciate the necessity for overcoming the habit and thus ensures better co-operation at home, shortens the treatment time, produces a more pleasing appearance and results in a stable correction.

I would like to emphasise three factors in successful muscle training:—

1. Accuracy in analysis of faulty musculature.
2. Development of proper exercises.
3. Enlistment of complete co-operation of the patient and parents.

The wholehearted co-operation of both the patient and parents is essential to the success of myofunctional therapy, and so to the final result. One must stress as earnestly as possible the importance of home co-operation in reducing the deformity, in restoring facial harmony, in regaining muscular balance and normal structural form and in obtaining stability in the end result.

The exercises must be taught to the patient thoroughly with the parent present during the instruction. Written directions are given for reference.

In cases where co-operation is doubtful, it may be wise to give a preliminary period of muscle training. Failure to co-operate at this time would be a warning that little help could be expected during the active treatment period.

The Pterygoid Exercise[13].

This exercise is designed to assist a retruded mandible to assume its normal position by developing the pterygoid muscles.

The principal muscles concerned in this exercise are the internal pterygoid and the external pterygoid; other muscles are, of course, involved during the performance of the exercise.

It consists in bringing the mandible forward from its retruded position so that the mandibular incisors are placed anteriorly to the maxillary incisors, provided that the latter are in their normal position. Where the maxillary incisors are in extreme protrusion the mandibular incisors should be protruded to the limit of their normal forward excursion.

13. Rogers, A. P.—Am.J.Orth. & Oral Surg., 26:1131, 1940.

Relax and recede the mandible to the point where the dental arches are in relatively correct mesio-distal relationship.

When the arches have been brought to correct form and into normal mesio-distal relationship, an infraversion of the molars and premolars may frequently be seen.

In this type of case the patient must be provided with an apparatus which will ensure the maintenance of the position of mechanical advantage. This is usually attained by some form of inclined plane.

Performance of this exercise during active treatment, when the arch form is being corrected, assists the patient in maintaining correct relationship of the dental arches without strain when the time arrives for the use of an inclined plane appliance.

Patient routine.

1. Thrust the lower jaw forward as far as possible so that the lower teeth are in front of the upper teeth.
2. Hold the jaw in that position while counting ten to one's self.
3. Relax and allow the jaw to recede until the arches are in relatively correct normal position.

   Do the exercise ten times; rest; do it ten times more.
4. Repeat at three specific periods daily and gradually increase the number to twenty at each session.

The Masseter-Temporal Exercise.

This exercise is valuable during some phase of treatment of all forms of malocclusion. It strengthens the muscles of mastication and is a valuable retentive measure. It is also used where general development is desired.

The exercise consists in alternate contractions and relaxations of the Masseter-Temporal groups of muscles with the teeth moved to and held in the correct position. It should never be performed unless the patient is able to place the mandible in a position of mechanical advantage: in other words, when the inclined planes, on being brought together, have a tendency to allow the teeth to settle into occlusion.

A position of mechanical advantage may be created if necessary by using an inclined plane apparatus either on a removable appliance or on a fixed lingual arch.

This inclined plane is not used until correct arch form has been obtained.

It is necessary to obtain correct arch form first because the constriction of the maxillary arch, particularly in the canine region, prevents the mandibular arch from moving forward into a position of mechanical advantage. Unless, or until, the lower arch can be placed in such a position, this Masseter-Temporal exercise should not be prescribed.

Patient routine.

1. Place the tips of the forefingers on the cheeks at the angles of the lower jaw in front of and below the ears.

2. Place the teeth together in correct position as shown.
3. Press the teeth together hard so that the fingers are forced outwards as the muscles of the jaws contract.
4. Hold this hard contraction of the muscles while counting ten to one's self.
5. Relax the muscles, keeping the teeth together in position, and then repeat.
   Do the exercise ten times; rest; and do the exercise ten times more.
6. Repeat the exercise at three specific periods daily, and gradually increase the number of contractions to 20 at each session.

The Tongue Exercise.

This exercise is an adjunct to the Masseter-Temporal exercise. It trains the tongue and strengthens those muscles which are particularly influential in the development of the mandibular arch.

After the child has learned the Masseter-Temporal exercise he is then instructed to place the tip of the tongue against the mucous membrane directly behind the lower incisor teeth, and with each contraction of the Masseter-Temporal group of muscles press the tongue against the anterior section and, at the same time, by the act of widening the tongue force it against the lateral sides of the alveolar process.

This exercise trains the tongue to remain in its proper position and has a tendency to prevent the narrowing of the lower arch, facilitating the early removal of the retentive appliance.

Patient routine.

1. After the patient has learnt and is performing the Masseter-Temporal exercise correctly, this exercise is added and is performed at the same time.
2. Place the tip of the tongue against the back of the lower front teeth.
3. Each time the teeth are pressed hard together also press the tongue hard against the lower front teeth, and at the same time try to widen the tongue and press it against the sides of the lower teeth.
4. When able to do this properly do it with each contraction of the Masseter-Temporal muscles.

The General Tonic Exercise.

This exercise is one which seems to have far reaching effects. It is particularly useful after the cessation of orthodontic treatment.

The advantages of this exercise are:

It promotes a copious flow of blood to the tissues surrounding the teeth.

It influences all the muscles of the face in which we are particularly interested: the Buccinator, the Orbicularis Oris and all the muscles that enter into its function.

It has great prophylactic value.

Patient routine.

1. Take a large mouthful of warm water in which is dissolved a portion of salt.
2. Hold the teeth firmly together in correct position and force the water out into the cheeks slowly then slowly back into the mouth.
3. Continue doing this until the muscles are slightly fatigued. Repeat five times each morning and night.

The Orbicularis Oris Exercise.

This exercise is designed to re-establish function and correct mouth-breathing when used in conjunction with other measures. It stimulates tonicity in the orbicularis oris and adjacent muscles. It is apparent how strengthening of all these muscles will aid in lip closure and retention of the denture.

This exercise may be performed by using the first two fingers of the right hand, but is best performed with the aid of an exerciser[14], which can be made simply from two old toothbrush handles and an elastic band. As the muscles grow in strength two bands may be used. It is not wise to overload the muscles.

Patient routine.

1. Hold the exerciser in the right hand and insert into the mouth.
2. Draw the lips tightly about the end pieces of the apparatus.
3. Alternate contractions and relaxations until a feeling of slight fatigue is experienced.
   Rest and repeat at least 20 times at 4 daily sessions.
4. The first two fingers of the right hand may be used in place of an exerciser.

Wilson's Exercise.

This exercise is useful when the under-developed a l hypotonic lips are due to chronic mouthbreathing.

A typical profile in such a case shows the short, soft, non-functioning upper lip, protruding teeth, lower lip full and hypotonic and resting lingual to the upper anteriors, and the deep mento-labial sulcus.

The effects of this exercise are:—

(1) To lengthen all the muscles of the Levator Anguli Oris group and the upper half of the Orbicularis Oris.
(2) To reduce in resiliency and size the lower half of the Orbicularis Oris.
(3) To develop the muscles of the lateral nasal wall.
(4) To increase the size and capacity of the nasal cavity.

Patient routine.

1. Close the teeth in correct position and close the lips lightly.
2. Contract the muscles at the left corner of the mouth, causing the corner to be pulled backwards and upwards.

14. Rogers, A. P.—J.A.D.A., 23:72, 1936.

3. While still holding this position with the fingers of the left hand placed on the right cheek, press these cheek tissues forward and to the left. The tissues at the left corner of the mouth must continue in contraction all through this muscle pulling.
4. While these tissues at the left corner are still contracted and the right cheek is under pressure by the fingers, breathe deeply three times through the left nostril.
5. Relax the muscles and remove the hand.
6. Repeat with the right corner of the mouth using the right hand.
7. Do this ten times each session increasing the number each day. Do three daily sessions.
8. Supplemental to these exercises all patients should wear cellulose tape strips at night.

Swallowing Exercise.

This exercise is used to correct abnormal swallowing habits and to train those muscles which are active in the swallowing function to work smoothly and without perverted contractions, especially along the line of a hyper-sucking contraction and tongue thrusting spasm.

Many muscles are involved in the swallowing act: the tongue, constrictors, and those of the suprahyoid group. The cause of the habit should be discovered and removed.

In a tongue habit ascertain just how it acts during swallowing to cause the malocclusion. Point this out to the patient and parent, and show them the correct method. Correction of such a habit will remove a prevalent cause of malocclusion and the active agent in the production of much recurrence after treatment.

Patient routine.

1. Have at hand a mirror and a glass of water.
2. Take a small sip of water sufficient to moisten the mouth.
3. Watch the mouth carefully in the mirror.
4. Place the teeth together and keep them in this position all through the exercise.
5. Close the lips gently and then swallow, with three things in mind:—
   (a) to keep the teeth together;
   (b) to keep the lips perfectly quiet;
   (c) to keep the tongue in the floor of the mouth and not pressing against the front teeth.
6. Repeat the swallowing slowly, taking a sip of water whenever it becomes hard to perform this act.
7. Do this exercise for at least two minutes and for three sessions a day. Do it frequently between practice periods, and increase the length of the exercise session, after one week, to three minutes.

It may be necessary for the patient to learn this exercise by stages, if the perversion is marked. In this case have him first practise swallowing with the teeth together, working on this step for one week. Then have him combine this step with an attempt also to keep the lips quiet. When he has learned to combine these two portions of the exercise successfully, have him add to these the control of the tongue.

The Mandible Restraining Exercise.

This is sometimes called the Platysma Exercise.

It is useful in Angle Class III cases or cases that are developing into Class III.

Patient routine.

1. Stand with the back against the wall.
2. At first hold a hand mirror and watch the teeth to see that they are in contact. The mirror may be discarded as soon as the exercise is correctly learned.
3. Bend the head back as far as possible and throw the shoulders well back.
4. Open the lips slightly so that the teeth are visible and close the teeth gently together.
5. Pull the mandible backwards as far as possible without losing tooth contact.
6. Hold this position and count 5 to one's self.
7. Relax the muscles and then repeat the exercise three times during each of the first two days, and gradually increase the number up to 10 times for each session.
8. Do this exercise at least three times a day and as many more times as possible.

Lip Blowing Exercise.

This is an exercise to develop the upper lip, nares, muscles of the front of the neck and improve the appearance of the face as a whole.

Patient routine.

1. Stand or sit erect, shoulders back and head up, teeth closed and lips together, chin up.
2. Take a deep breath, blow out the upper lip, hold the air there while counting 4 slowly.
3. Relax and repeat ten times. Do this exercise 4 times daily, include it in the regular routine along with the others.

Lip Elongating Exercise.

This exercise is designed to lengthen the upper lip.

Patient routine.

1. Bring the upper lip down by forced muscular action until it completely covers the upper incisors and presses strongly against their crowns. The mandible must be depressed in order to do this, but care should be taken not to have the lower lip press against the lower incisors unless this action is desired.

   Sometimes, in order to avoid the latter pressure, it is necessary to have the child grasp the lower lip with the fingers and pull it away from the lower front teeth while the upper lip is contracted.
2. Maintain the upper lip in this state of forced contraction while the patient slowly counts 10. The lip is then relaxed.
3. Do this 10 times in succession.
4. This exercise is performed at least 4 times daily.
5. This exercise is also done as many additional times a day as the thought comes to the patient's mind.

The DENTAL JOURNAL of AUSTRALIA
N.S.W.

EDITORIAL DEPARTMENT

IN THE BEGINNING

We are in danger of forgetting our mouths and remembering only our teeth.

We who minister the mysteries of dentistry to the end that the mouth shall be always wholesome and useful; those priests, parents and policemen, enjoined by God, love and duty to ensure that the evil word does not issue from its lips; the poets, politicians and prima donnas who live by the glories of speech and song; all we beings, drinking, eating and articulating our thoughts, let us give time now to consider the principal member of the living body—the mouth—which has made the animal kingdom possible and made man the greatest thing on earth.

We will recall the evolution of the mouth, which dental science prefers to call the oral cavity.

The first primeval filaments of life in this planet had but a smooth skin between their egos and the elements of the universe. The joy of living even at this humble standard was apparently very real and the first amoeba to produce a wrinkle in that skin discovered that it could feel itself and hold the more attractive elements in close embrace and undoubtedly gained much personal satisfaction. Thus, so we are taught, was the mouth first formed.

The earliest sensations which animal life enjoyed must have been that of smacking the lips together and even now much pleasure is to be obtained that way. At a later stage the primitive lips and mouth learnt to discriminate between substances, and the sense of touch was born. The mouth continues to excel in the exquisite sensibilities of contact.

Then developed the discernment of tastes and flavours, and the mouth became the food intake of the body; the other organs were developed as required to cope with this flood of life passed on by the ever ready mouth.

The jaws and teeth were grown to increase the intake and the animal kingdom was now under way.

Following the normal course of expanding the business, the next step was undertaken by the mouth—that of advertising the supremacy of the animal kingdom over all others. Animal noises were produced and have been brought to a great pitch of perfection, as is evidenced by those mechanical extensions of the mouth, the trumpets of the brass band.

It will be remembered that the teeth and jaws became animals' first weapons, the hooves, horns and claws being very second-line armament; and with man himself the mouth is still a weapon greater than the hydrogen bomb in power of destruction, for with the spoken word he starts and ends all his battles.

But to return to our chronology. Having made the sound, the mouth now framed the language which lifted man above the animal status and gave the means for exchange of thought between men. Civilization had now arrived.

This extraordinary organ confers on us the benefits of touch and taste, that we may savour the nutriment that it procures and prepares to maintain our lives. It produces speech and laughter, expresses our emotions, indicates character, qualifies beauty and even functions as a third hand. What other part of the body can offer a tithe of such service?

Should one wonder, then, that the mouth is held in high regard by those who own them and is considered a most intimate part of the body's personality? It is the *sine qua non* of human existence.

We dentists have forgotten that we are the custodians in law of the greatest monument of human achievement and think of ourselves as merely making our small contribution to bolster up the failing human health.

With our mouths we must tell the people how important is our role in human society.

News and Notes

PRESENTATION TO PROFESSOR W. J. TUCKFIELD

An unofficial committee has been formed in Melbourne with the object of making a presentation to Professor W. J. Tuckfield, on his retirement from the Chair of Dental Prosthesis in the University of Melbourne. Professor Tuckfield is well-known amongst members of the Profession in this State, being Editor of the *Australian Journal of Dentistry*, and having been active in Association affairs over a long period and as a lecturer at the Australian College of Dentistry.

It is felt that it would be most appropriate to obtain a portrait of Professor Tuckfield, as a token of the esteem in which he is held. You are thus invited to make a subscription, *not exceeding one guinea*, and forward it to Dr. F. A. Aird, 9 Yuille Street, Brighton, S.5., Victoria.

THE LATE A. A. WILSON

It is with great regret that we record the recent death of Mr. Arthur Avonmore Wilson, a very well-known and esteemed member of the Association.

Mr. Wilson was associated with the dental profession for 45 years and during that period he was always active in the professional organisations. He was President of the Society of Dental Science, N.S.W., during two separate years and Vice-President and a member of the Council on other occasions.

Mr. Wilson became a member of the Executive of the Australian Dental Association, New South Wales Branch, on its inauguration and has consistently represented the members of the Association on its Executive from that date (1929) to the end of 1947, when he retired. He was Vice-President of the Association from 1941-45 inclusive and was Chairman of several committees on many occasions and a member of other committees.

One of the greatest services which Mr. Wilson rendered to the Association was as a member of the Sports Committee from its inception in 1929 to his retirement in 1947, being Chairman of that Committee for 15 years. It was largely due to his efforts that the Sports Days were always such a success.

It was fitting that Mr. Wilson's services to the profession should be recognised in his election as an honorary member of the Association for this year.

Finally, may we add a tribute from one of Mr. Wilson's contemporaries:— "Of the many non-graduates I have associated with in my 48 years' connection with our profession, I can look back to Arthur Wilson's unselfish work as outstanding. His co-operative spirit at the many meetings years ago and his continued help with Sports Days, etc., in later years should, I feel, receive due appreciation and recognition. He passes on as one of the unselfish gentlemen who have given of their best to the profession."

WESTERN SUBURBS DENTAL GROUP

Sports Day

This Group were once again fortunate in having a fine day for their Seventh Annual Sports Day on Thursday, 24th May, 1951. Over 120 dentists entered for the Golf and Bowls events, afterwards gathering at the Clubhouse to renew old acquaintances.

The President, Mr. R. G. Leeder, extended a warm welcome to all visitors, including representatives from the Dental Board, the Australian Dental Association (New South Wales Branch), the Blue Mountains Division and the various metropolitan Groups and Associations.

The prizewinners were as follows:—

Golf:	Cup:	F. Holt.
	Runner-up:	J. McGovern.
	4-Ball:	T. Dobson, F. Holt.
	Runners-up:	I. Steele, H. Ratcliffe.
	A grade:	C. Everingham.
	B grade:	T. Purtell.
	1st Nine:	J. Newman.
	2nd Nine:	R. McCrossin.
	Sealed Nine:	C. Newton.
	Long Drive:	F. Dundas.
	Pitch & Putt:	E. Bastian.
	Consolation prize:	D. Waine.
Bowls:	Winners:	D. Steele, R. Hawthorne, R. Cloutier, J. Hogue.
	Runners-up:	R. Chapple, V. Slocombe, H. Hicks, C. Adair.

Annual Ball

Debutantes were presented for the first time at a Dental Ball in this State at the Western Suburbs Dental Group's Fourth Annual Ball held at Petersham Town Hall on Tuesday, 12th June, 1951.

After being presented to Sir Harry and Lady Moxham, the seven debutantes and their partners made a most attractive picture dancing the minuet. At the conclusion of this dance they received from Sir Harry and Lady Moxham a card printed by the Group as a memento of the occasion.

Many of the members of the Group took advantage of the opportunity to entertain their friends in a convivial atmosphere and with an excellent supper.

Happy have we met! Happy have we been! To our next merry meeting.—R.D.

UNIVERSITY OF MALAYA, SINGAPORE

Applications are invited for Lectureships in the Dental Department in the fields of Orthodontia, Preventive Dentistry, and Prosthetic Dentistry. Dental qualifications and teaching experience essential. Total emoluments—approximately £2,450 sterling (U.S. $6,982). Appointments tenable for one to three years with free passages on appointment and termination.

Further particulars available from the Registrar, University of Malaya, Singapore, with whom applications (seven copies) together with the names of three referees, must be lodged not later than 15th October, 1951.

Association Activities

NEW SOUTH WALES BRANCH
EXECUTIVE MEETINGS

Extract from the Minutes of the Meeting of the Executive Committee held in the Council Room, B.M.A. House, 135 Macquarie Street, Sydney, on Monday, 18th June, 1951, at 7.30 p.m.

Present: Dr. A. G. H. Lawes, Vice-President, in the Chair; Dr. F. E. Helmore, Vice-President; Mr. F. R. Reid, Honorary Treasurer; Dr. E. H. Bastian, Mr. N. E. Edney, Mr. H. M. Finnie, Mr. J. G. Fletcher, Mr. E. J. Gee, Mr. W. A. Grainger, Mr. A. G. Hunter, Mr. R. Krauss, Mr. R. G. Leeder, Mr. R. Y. Norton, Mr. Ralph Tompson, Mr. R. W. Wilson; Mr. A. R. Wooller, North and North West Division; Mr. M. J. Griffin, Blue Mountains Division; Mr. C. Reynolds, Newcastle & Hunter River District Divison; Dr. J. D. Oddy, South Coast Division; Dr. A. G. Rowell, Western Division.

Apologies: Dr. E. R. Magnus, Mr. S. H. Neal.

In attendance: Mr. E. F. Hewlett, Secretary.

Minutes: The Minutes of the Meeting held on 14th May, 1951, were confirmed, subject to a minor correction.

Business Arising from the Minutes:

Dental Prosthetist matters: The Secretary reported that, subsequent to satisfactory changes having been made in the Constitution, By-laws and rules of he Dental Prosthetists' Association of New South Wales, and its name having been changed to the Dental Technicians' Association of New South Wales, Mr. Justice Webb proceeded to vacate his order for de-registration of the Union. He further proceeded to deal with the Dental Mechanics (State) Award, which he varied to conform strictly with the sense of his Judgment. The Award as varied has been rewritten and the minutes of same were settled by the Industrial Registrar on 18th June, 1951.

Dental Assistants lectures: The Chairman of the Syllabus Committee reported that his Committee had considered the subjects and lecturers for the proposed series of lectures to members of the Dental Assistants' Association, New South Wales, and that seven suitable subjects and lecturers had been decided upon.

Dental fees: Following discussion on the question of dental fees, it was resolved that, while the Executive considers that the matter of fees is one for individuals, it does not oppose determination of fees by the divisions or equivalent organisations, in which case any publicity required may be arranged by such local organisations, provided no individuals' names appear in such publicity.

Business of the Meeting:

Dental Mechanics (State) Conciliation Comittee: As it was necessary to nominate a member and alternate members for this committee, Mr. E. F. Hewlett was re-nominated as member and Messrs. R. W. Wilson and N. E. Edney re-nominated as alternate members.

Research Scholar: The sum of £150, being the Association's contribution to the salary of the Research Scholar, Mr. B. Lilienthal, for the second half of the third year of tenure of the scholarship, was passed for payment.

Repatriation Dental Treatment: Letters from the Federal Office concerning dental treatment for those eligible for same under Repatriation Department regulations were considered and it was resolved that the Federal Office be informed that this State Branch does not approve of the scale of fees as set out in the correspondence, the scale being reviewed by the Committee and the reviewed scale forwarded to the Federal body.

Reports from Committees:

Journal Committee: The Chairman of the Journal Committee reported that his Committee had again reviewed Journal finance and recommended to the Executive that six bi-monthly issues of the Journal be produced in the financial year 1951-52 and that a change of format not interfering with the standard of the Journal be arranged as soon as possible.

Dental Health Committee: The Chairman of this Committee reported that his Committee had completed a review of activities of the Dental Health Education Department. This review, together with suggestions as to the activities of Divisions in regard to dental health education, would be circulated. He further reported that a school dental essay competition had been arranged for September/October, as had also an essay competition for the R.A.A.F. and the R.A.N.

Membership:

New members: It was resolved that the following dental practitioners, whose applications were in order and who had paid the requisite subscriptions, be admitted as members of this State Branch as from 18th June, 1951:—

Bulluss, Malcolm Henry Robert, B.D.S.; Carter, Henry Phillip, B.D.S.; Cooke, Pearce Goude, B.D.S.; Cumming, John, Jnr., B.D.S.; Finos, Jason, B.D.S.; Lloyd, Mervyn James, B.D.S.; Moody, James Stuart, B.D.S.; Smithers, Russell Arthur, B.D.S.

Student Associate: It was resolved that the following Fourth Year student in the Faculty of Dentistry, University of Sydney, who had made application and paid the requisite subscription, be accepted as a Student Associate of this State Branch as from 18th June, 1951:—

Ulrick, Milton Charles.

Correspondence:

Department of Education: A letter from the Department of Education in answer to our letter concerning children being necessarily absent from school while undergoing dental treatment was read, in which it was stated that while the Department was unable to issue instructions that children absent from class because of dental treatment be marked present no action would be taken against children for absence under such circumstances. "The Department appreciates the importance of proper care of the teeth and realises that all dental treatment cannot be obtained outside school hours."

Financial Statement:

The Honorary Treasurer, Mr. F. R. Reid, tabled the Financial Statement for the month of May, 1951, which had ben circulated to members of the Committee, and it was resolved that the Financial Statement for the month of May, 1951, be received.

Closure of meeting: The meeting terminated at 11.55 p.m.

Extract from the Minutes of the Meeting of the Executive Committee held in the Council Room, B.M.A. House, 135 Macquarie Street, Sydney, on Tuesday, 17th July, 1951, at 7.30 p.m.

Present: Dr. E. R. Magnus, President, in the Chair; Dr. A. G. H. Lawes, Vice-President; Dr. F. E. Helmore, Vice-President; Dr. E. H. Bastian, Mr. N. E. Edney, Mr. H. M. Finnie, Mr. J. G. Fletcher, Mr. W. A. Grainger, Mr. A. G. Hunter, Mr. Ralph Tompson; Dr. A. G. Rowell, Western Division; Dr. J. D. Oddy, South Coast Division.

Apologies: Mr. E. J. Gee, Mr. R. Krauss, Mr. R. G. Leeder, Mr. R. Y. Norton, Mr. F. R. Reid, Mr. C. D. Reynolds, Mr. R. W. Wilson.

In attendance: Mr. E. F. Hewlett, Secretary.

Minutes: The Minutes of the Meeting, held on 18th June, 1951, and of the two Special Meetings, held on 26th June and 9th July, 1951, respectively, having been circulated to members, were signed as a correct record.

Business Arising from the Minutes:

Articles of Association: Further discussion on the proposed amendments to the Articles of Association took place and the Association's Solicitor was instructed in these matters.

Business of the Meeting:

Industrial matters: The Secretary reported that the terms of the emergency order in relation to the electricity restrictions and its application to Award for dental employees, together with the fact of the abolition of the "Elsewhere" rates of pay in the Awards, had been circulated to members. He further reported on the recent amendments to the Industrial Arbitration Act by the State legislature and indicated that these amendments in regard to long service leave, preference to Union members and right of entry by Union officials, would be included in the various State Awards when the industrial authorities dealt with each individual Award in the future. He reported that a questionnaire had been forwarded to members in an endeavour to assess the incidence of long service leave in members' practices.

Reports from Committees:

Journal Committee: The Chairman of the Journal Committee reported that Mr. Sullivan had relinquished his position as Honorary Editor of the *Dental Journal of Australia*, due to his impending departure for overseas. The meeting passed a vote of thanks to Mr. Sullivan and authorised a suitable honorarium.

Committee for the Annie Praed Oration: The Chairman of this Committee reported that arrangements were well in hand for this occasion and that publicity would be given to members with the next monthly meeting notice.

Membership:

New members: It was resolved that the following dental practitioners, whose applications were in order and who had paid the requisite subscriptions, be admitted as members of this State Branch as from 17th July, 1951:—

Berry, Robert Allen, B.D.S.; Cox, Clive Leslie, B.D.S.; Cummins, William Daniel, B.D.S.; Hall, Reginald William Lewis, B.D.S.; Horne, Charles Kenneth, B.D.S.; King, Wallace Robert Oliver, B.D.S.

Restricted members: It was resolved that the following dental practitioner, whose application was in order and who had paid the requisite subscription, be admitted as a restricted member of this State Branch for the year 1952:—

Sullivan, Harold Richmond, M.D.S.

Student Associates: It was resolved that the following Fourth Year students, in the Faculty of Dentistry, University of Sydney, whose applications were in order and who had paid the requisite subscriptions, be admitted as Student Associates of this State Branch for the year 1951:—

Douglas, K. D.; Tofler, Gerald Jachin; Willis, John Hubert.

Report from Conjoint Meeting:

Repatriation Dental Treatment: The resolution of the Conjoint Meeting of the Delegates from Divisions and the Executive Committee, concerning the circularisation to members of information relating to Repatriation Dental Treatment, was considered and it was decided to advise members of the decision and inform the Federal body.

Financial Statement:

In the absence of the Honorary Treasurer, the Financial Statement for the month of June, 1951, was presented by the President, copies of same having been circulated to members of the Committee, and it was resolved that this Statement be received.

Closure of meeting: The meeting terminated at 11.15 p.m.

At a Special Meeting of the Executive held on 20th June, 1951, at which the following members were present:—

Dr. A. G. H. Lawes, Vice-President, in the Chair; Dr. F. E. Helmore, Vice-President; Dr. E. H. Bastian, Mr. J. G. Fletcher, Mr. E. J. Gee, Mr. A. G. Hunter, Mr. R. G. Leeder, Mr. R. Y. Norton, Mr. Ralph Tompson, Mr. R. W. Wilson; Dr. A. G. Rowell, Western Division; and the following members presented apologies:—

Dr. E. R. Magnus, Mr. F. R. Reid, Mr. N. E. Edney, Mr. H. M. Finnie, Mr. W. A. Grainger, Mr. R. Krauss, Mr. C. Reynolds, Mr. M. Griffin; these matters were dealt with amongst others:—

Changes of Articles of Association: The proposed new Articles of Association in regard to forms of membership and allied matters, as prepared by the Association's Solicitor, were before the meeting and were discussed and approved subject to certain further attention.

Lectures arranged by Dental Health Committee: Permission was given for certain lectures to be delivered.

Federal Constitution: The revised Federal Constitution was further discussed and certain suggestions made to be conveyed to the Federal body.

Gift to Library: It was reported that Mrs. P. Ash, widow of the late Dr. Percy Ash, had offered to the Association for whatever use it deemed fit a considerable number of bound volumes from the late Dr. Ash's library. It was resolved that this offer be accepted and that the Association's appreciation be conveyed to Mrs. Ash.

At a further Special Meeting of the Executive held on Monday, 9th July, 1951, at which the following members were present:—

Dr. A. G. H. Lawes, Vice-President, in the Chair; Dr. F. E. Helmore, Vice-President; Mr. F. R. Reid, Honorary Treasurer; Mr. N. E. Edney, Mr. H. M. Finnie, Mr. J. G. Fletcher, Mr. E. J. Gee, Mr. W. A. Grainger, Mr. A. G. Hunter, Mr. R. Krauss, Mr. R. G. Leeder, Mr. R. Y. Norton, Mr. Ralph Tompson, Mr. R. W. Wilson; Mr. M. J. Griffin, Blue Mountains Division; Mr. C. Reynolds, Newcastle and Hunter River District Division; Dr. J. D. Oddy, South Coast Division; Mr. L. Cooper, Southern Tablelands Division; Dr. A. G. Rowell, Western Division; and the following members presented apologies:—

Dr. E. R. Magnus, Dr. E. H. Bastian, Mr. S. H. Neal;

certain matters were dealt with, amongst which was the matter of the application for the variation of the Dental Attendants and Secretaries (State) Award to enable the inclusion of a clause governing conditions for casual or part-time employment. It was resolved that the necessary proceedings be implemented for such an application for variation of the Award.

AUSTRALIAN DENTAL ASSOCIATION
(NEW SOUTH WALES BRANCH)

DIRECTORY OF MEMBERSHIP, 1950-1951

SYMBOLS

(B.M.)	—Blue Mountains Division.
(F.N.)	—Far North Division.
(N.H.R.)	—Newcastle & Hunter River District Division.
(N.N.W.)	—North & North West Division.
(N.E.)	—North Eastern Division.
(S.)	—Southern Divison.
(S.C.)	—South Coast Division.
(S.T.)	—Southern Tablelands Division.
(W.)	—Western Division.

Note: The numerals following the street address indicate the postal zone number.

ABBREVIATIONS
KEY TO UNIVERSITY DENTAL SCHOOLS AND COLLEGES

Adl.	—University of Adelaide.
Alb.	—Alberta University, Canada.
Br.	—University of Bristol.
Calif.	—University of California.
Chic.C.D.	—Chicago College of Dentistry.
Ed.	—University of Edinburgh.
Eng.	—England.
F.A.C.D.	—Fellowship of the American College of Dentists.
F.I.C.D.	—Fellowship of the International College of Dentists.
Harv.	—Harvard University Dental School.
L.	—University of Leeds.
Melb.	—University of Melbourne.
Minn.	—University of Minnesota.
N.Z.	—New Zealand.
N.U.	—Northwestern University, Chicago.
Ont.	—University of Ontario.
Penn.	—University of Pennsylvania.
Phil.	—Philadephia Dental College.
Pit.	—University of Pittsburgh.
Q'ld	—University of Queensland.
R.C.S.(Eng.)	—Royal College of Surgeons, England.
Syd.	—University of Sydney.
Tor.	—University of Toronto.
T.U.Phil.	—Temple University, Philadelphia.

In this issue the list of members of the Australian Dental Association, New South Wales Branch, is presented. Please check your name for spelling, and address; forward any correction to the Secretary, Australian Dental Association, New South Wales Branch, 135-137 Macquarie Street, Sydney. Retain this issue for future reference.

A.

Abbott, Bruce, 140 Malabar Rd., South Coogee. B.D.S. (Syd.).

Abbott, Richard Henry, Ulong St., Griffith, 5S. (S.). B.D.S. (Syd.).

Adair, Cecil, 243 Elizabeth St., Sydney. L.D.S., R.C.S. (Eng.), D.D.S. (Minn.).

Adey, Alfred, 134 Glebe Point Rd., Glebe. B.D.S. (Syd.).

Agnew, Randolph Langley, Box 288, P.O., Tamworth, 4N. (N.N.W.).

Ahern, Gerald John, Box 36, Inverell, 5N. (N.N.W.). B.D.S. (Syd.).

Ainsworth, Eric Charles, T. & G. Bldg., 76 Fitzmaurice St., Wagga Wagga, 3S. (S.).

Aitken, James Alexander, 44a Railway Pde., Burwood. B.D.S. (Syd.), D.D.S. (N.U.).

Aitken, Malcolm John, 28 Newton Rd., Strathfield. B.D.S. (Syd.), D.D.S. (N.U.).

Alcock, David Leslie, George St., Quirindi, 4N. (N.N.W.). B.D.S. (Syd.).

Alderman, Frederick John, 99 The Grand Pde., Brighton le Sands.

Alexander, Ernest Arthur, 99½ Tudor St., Hamilton, 2N. (N.H.R.).

Alexander, Gordon Merton, 229 Macquarie St., Sydney.

Alexander, Reginald Harry, 278 Anzac Pde., Kensington.

***Alkin, Thomas Turner,** 196 Bourke St., Goulburn, 2S.

Allcock, Brian Grant, 30 Railway St., Chatswood. M.D.S. (Syd.).

Allcock, Bruce Harry, United Dental Hospital, Chalmers St., Sydney. B.D.S. (Syd.).

Allen, Aleck Andrew, 27 Railway Pde., Lakemba. B.D.S. (Syd.).

*Restricted member.

Allen, George Kingsmill, 93a Blaxland Rd., Ryde.
Allen, Wallace Bruce, 21 George St., Marrickville. B.D.S. (Syd.).
Allen, Wallace Carlingford, 400 Marrickville Rd., Marrickville.
Alsaker, Norman Swend, 175 Macquarie St., Sydney. D.D.S. (Pit.).
Alvarez, John Gilbert, 4 Werambie St., Woolwich. B.D.S. (Syd.).
Anderson, Colin Eric Millar, 650 New South Head Rd., Rose Bay. B.D.S. (Syd.), D.D.S. (Tor.).
Anderson, Donald Alfred, 53a The Corso, Manly. B.D.S. (Syd.).
Anderson, Patrick Joseph, 28 Lamascotte Av., Concord. B.D.S. (Syd.).
Andrews, William Robert, 185 Elizabeth St., Sydney.
Anker, John Harris, 195 George St., Bathurst, 3W. (W.). B.D.S. (Syd.).
Annetts, Allan Charles, 204 Church St., Parramatta. B.D.S. (Syd.).
Arkins, Errol Dudley Blatchford, United Dental Hospital, Chalmers St., Sydney. B.D.S. (Syd.).
Armstrong, Allan Gustave, 185 Elizabeth St., Sydney.
Armstrong, Robert Frederick, 12 Harold St., Parramatta. B.D.S. (Syd.).
Armstrong, Stanley William George, Melbourne St., East Maitland, 3N. (N.H.R.).
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New Books and Publications

Principles and Technics for Complete Denture Construction, by Victor H. Sears, D.D.S., St. Louis, 1949. The C. V. Mosby Company. Price £2 12s. 6d. *Our copy by courtesy of W. Ramsay (Surgical) Pty. Ltd., Melbourne.*

Probably all authors agree that the best books are yet to be written—by the critics. However, in reviewing Sears' book, one pays tribute to the considerable effort required for the publication of any book aspiring to serious standards. Sears has made a worthy contribution to prosthetic dentistry. The general practitioner will benefit from a careful reading of this book although in the preface the author implied an intention to write at undergraduate level. Ideas are clearly expressed and the supporting illustrations are adequate. It is refreshing to find techniques based upon principles so well expounded, because dental literature is sometimes the refuge of bold generalisations without deference to validity or authority. The use of odd numbered chapters for principles and even numbered chapters for their application, though novel, scarcely serves the purpose intended. A division of attention could be avoided by a statement of principle and then immediately its practical importance.

It is doubtful whether Sears' definition of terms clarifies an already overburdened terminology. However, to take one example, the term "posterior palatal seal" could be adopted universally, in preference to the ubiquitous "post dam" which is more suggestive of an afterthought in water and drainage ailments than a precise anatomical and technical entity in full denture construction.

The author's knowledge of jaw relationships and occlusal positions is, in general, one of understanding although one may not always agree upon the descriptive terminology. Students of prosthetic dentistry will also question the claim that in mastication the temporo-mandibular joint acts as a fulcrum. Anatomy does not support this opinion. Leverage factors do occur but not, on evidence, with the temporo-mandibular joint as the fulcrum.

A strong case is made for the status of non-anatomic posterior tooth forms and their benefit to denture stabilisation. It is a just contention that these teeth greatly eliminate horizontal stress components. The question is, "Are they more efficient?" If not, the accumulated pressures, necessary to perform a given task of mastication, might well offset with bone resorption the stabilisation advantages. Should these teeth be less efficient, then their use in those cases where basic stabilisation factors are favourable denies patients the more efficient masticatory restoration obtainable with acceptable cusped teeth.

At the end of each chapter is a list of books for reference. The practice of writing scientific articles without specifying the opinions held by various authorities is to be discouraged. Those who have made the text possible should not lose identity in a long list of publications worth consulting.

There is in this book much of practical value. Important phases of full denture prosthesis are discussed and presented with an unusual ease of authorship. The post-graduate student will find something to disagree with and much to endorse. It is, therefore, a stimulating book and Sears, who has made so many fine contributions to dental literature, is to be thanked for this extra effort. Appreciation must also be extended to the publishers, C. V. Mosby and Company, who once again maintain their high standard of production which is a credit to dentistry.—J.H.W.

The Basis of Chemotherapy, by Thomas S. Work and Elizabeth Work, Edinburgh, 1948. Oliver and Boyd Ltd. *Our copy by courtesy of the publishers.*

This book, which is clearly printed on good paper, is the result of the collaboration of Thomas S. Work, B.Sc., Ph.D., of Research Staff, National Institute for Medical Research, London, and Elizabeth Work, B.A., Ph.D., of Research Staff, Department of Chemical Pathology, University College Hospital Medical School, London.

Due to the intense research being conducted and the rapid advances being made in chemotherapy, especially of the antibiotics, this book cannot, of course, cover the last few years' developments. The authors have endeavoured to relate chemical, biochemical and pharmacological findings to the mode of action of chemotherapeutic drugs.

Although the word "chemotherapy" means, broadly speaking, the therapeutic use of any chemical, the authors have restricted the meaning of the term to the chemical treatment of disease of microbial origin, with a view to eliminating such microbial infection. Their object has been to weld many diverse sciences into a single framework in order to find a basis for what they term the "hybrid" science of chemotherapy.

As evidenced by a lengthy bibliography, they have endeavoured to supplement their own original work by using the findings of experts in the vast fields of chemistry, biology and bacteriology to the full, with due acknowledgment. This is a fitting attitude towards a subject which must find many research workers groping for more light on branches of science in which, by their very diversity, they must be less than expert.

The opening chapter, "Historical Introduction," deals firstly with the "materia medica" of the days of pure empiricism (trial and error with herbal remedies, concerned with effect without study of cause). It then traces the growth of European medicine to the establishment of the germ theory and passes on to the development of chemotherapy by Ehrlich, "father of the science of chemotherapy" (who, however, did most of his study on protozoa and spirochaetae). The authors make the interesting and surprising statement that the first cure of a bacterial infection by specific chemotherapy was reported as recently as 1911: the destruction of pneumococci in mice by a quinine derivative. The chapter concludes with a brief statement of the theories governing the use of the amidines, the sulphonamides and the antibiotics, these last being defined as "soluble antibacterial substances produced by micro-organisms during growth on suitable media."

The second chapter is entitled "Cell Metabolism." It stresses the need for the study of the distribution of drugs in the host, their effect on cell metabolism and how this effect influences chemotherapy, and stresses how imperfect is our present knowledge of this phenomenon.

Chapter III deals with the metabolites essential to the growth of micro-organisms such as riboflavin, biotin and folic acid.

Chapter IV reviews enzyme inhibition, deals with their action as catalysts and emphasises the difficulty of inhibiting inimical organisms without injuring the host unless an effective alternative path is available to the host.

Chapter V is headed "Drug Antagonism" and deals with its influence on the growth of micro-organisms. It refers to the interesting theory that sulphanilamide is taken up by bacteria instead of *p*-aminobenzoic acid (P.A.B.A.) because of similar chemical structure.

Chapter VI reviews drug resistance in organisms, not only acquired resistance, as experienced with the sulphonamides, but inherent resistance such as that evidenced by pain negative organisms to penicillin. It discusses the mechanism of drug resistance and mentions a matter of extreme importance to us professionally—the possibility of this resistance being developed by indiscriminate prophylactic use of chemotherapeutic drugs.

Chapter VII deals with a phenomenon long observed, the relationship between chemical structure and biological activity. Here again we see the need for a biologist to make intensive study of a field not properly his own and it emphasizes the collaboration of experts necessary for the full development of therapeutics generally.

In conclusion, the authors assert that the transition stage has been reached —theory has overtaken fact and has begun to shape the future. However, a study of the tenor of the whole work emphasizes the many avenues of this subject still to be explored to the full and hints at the existence of avenues as yet unvisited.

The work is a definite contribution to the knowledge of the theory and practice of chemotherapy and we shall look forward to further findings published by these energetic collaborators.—L.C.

Information from the Dental Board

Extract from the Minutes of the Meeting of the Dental Board held on Wednesday, 29th August, 1951.

Present: Dr. J. S. Baird, Prof. A. J. Arnott, Mr. G. R. Cameron, Dr. H. G. Wallace, Mr. N. E. Edney, Dr. A. G. H. Lawes and Dr. E. R. Magnus.

Apology: Mr. E. B. Cahalan.

Dental Board loan: The Board decided to grant a loan of £100 from the Dental Board Education and Research Account to a dental student, subject to him completing the necessary formalities. It was also decided to publicise the availability of loans in certain circumstances.

Applications for registration: Edward J. Killalea, B.D.S., University of Sydney, 1951, was granted registration.

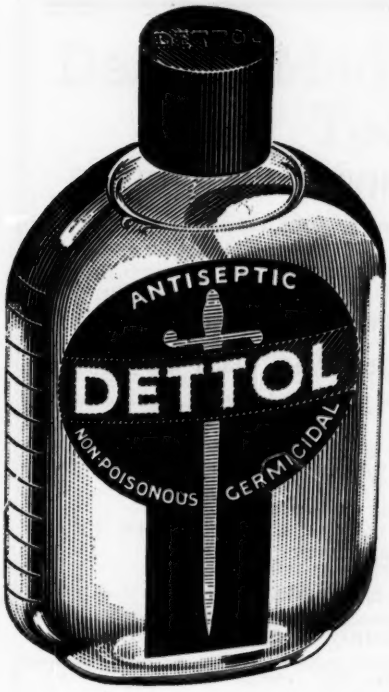
Foreign applicants: One application was referred to the Sub-committee on foreign dentists for report. The applications of five others were refused. Two more had their Certificates of Qualification "recognised" and were to be required to sit for an examination under Regulation 28 in November next before examiners to be appointed by the Board.

Additional descriptions: The Board gave its approval to the entry in the Register and the use of the additional descriptions as follow:

Maxwell C. Halliday, D.D.S., Northwestern; Phillip B. Green, D.D.S., Northwestern.

Alteration of name: Mr. Walter Schwarz changed his name to Walter Richard Black by deed poll.

Publicity: The Board agreed to the Registrar providing selected items from the Minutes to the Australian Dental Association for publication.



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